
BC hydro

Preliminary Planning Report

Kelly Lake to Cheekye Substation Second 500 kV Transmission Line

May 1990



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to
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Second 500kV Transmission Line

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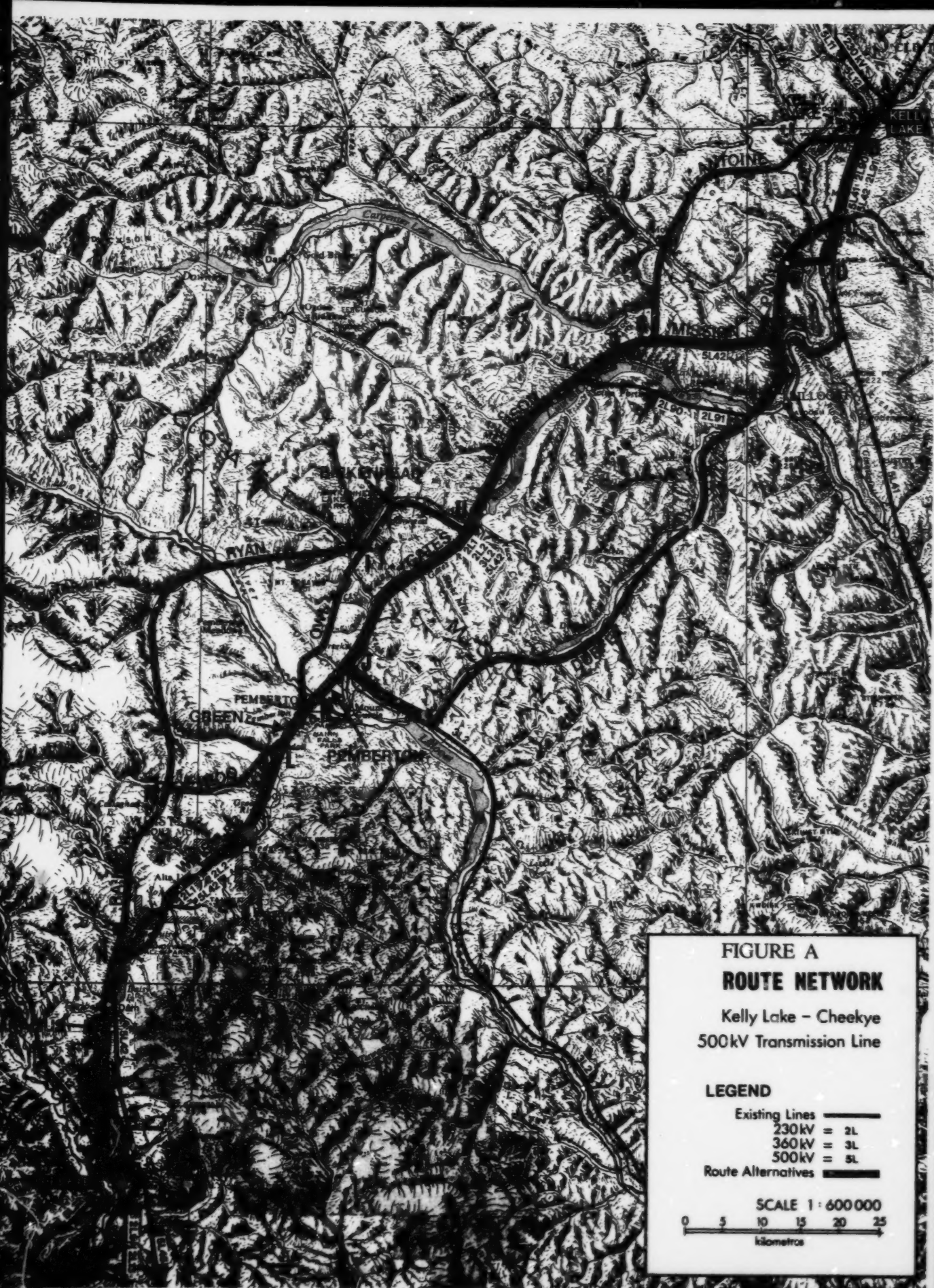


FIGURE A

ROUTE NETWORK

Kelly Lake - Cheekye
500kV Transmission Line

LEGEND

Existing Lines
230kV = 2L
360kV = 3L
500kV = 5L

Route Alternatives

SCALE 1 : 600 000

0 5 10 15 20 25
kilometres

PRELIMINARY PLANNING REPORT

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EXECUTIVE SUMMARY

The project under study is the design and construction of a single circuit 500 kilovolt (kV) transmission line (Circuit 5L46) from Kelly Lake substation, near Clinton, to Cheekye substation, near Squamish. Part of the project is the removal of the existing 230kV transmission line (Circuit 2L1) from Shalalth to Cheekye making its right-of-way (ROW) available for use by 5L46, where appropriate.

B.C. Hydro initiated new environmental and technical studies of this project in 1989, and a related public consultation program. The studies are now nearing completion and the first round of public consultation was completed in the fall of 1989. This report presents the findings of the studies and public consultation.

The consultation program included meetings with all elected representatives in the area, except several Indian Band Councils, and eight Open Houses for the public. The Lillooet Tribal Council has advised B.C. Hydro that it will propose "a structure for negotiations" and is considering suggestions discussed in meetings with B.C. Hydro regarding the project. The Mount Currie Band Council has informed B.C. Hydro of its opposition to the project.

The main opinions, of the environmental consultants and the public, expressed to date are:

1. The use of the Antoine, Duffey, Birkenhead, Owl, and Ryan segments is not favored for environmental and/or social reasons.

The Squamish Lillooet Regional District, Village of Lillooet, and Mount Currie Indian Band have advised they oppose use of the Duffey segment. The Regional District strongly favors use of the existing corridor.

Removal of these segments from the network results in use of the existing corridor (i.e. following 5L42 from Kelly Lake to Seton Portage, and 2L2 and 5L42 from Seton Portage to Cheekye.)

2. General agreement has not yet emerged as to whether the project should bypass the Resort Municipality of Whistler or replace 2L1 in the transmission corridor through Whistler. To bypass Whistler would reduce visual impacts in Whistler to a limited extent while traversing areas of possible future importance to Whistler for recreation.

3. It is the opinion of the environmental consultants that use of the 2L1 ROW in the lower Cheakamus Valley has less environmental impact than use of alternate options, subject to an adjustment at the south end to avoid the North Vancouver Outdoor School. Further analysis and discussions are required before a route can be determined for that area north of the Outdoor School, where residents are opposed to use of the existing ROW.

It is B.C. Hydro's intent to assess conclusions reached so far by release of this report to government agencies and the public, by discussion with the Indian Bands, and further consultation with the public. Barring major changes in public opinion, or emergence of presently undisclosed contrary opinion, it is B.C. Hydro's intent to apply for an Energy Project Certificate to construct the project in the existing corridor, except that no decision on route is yet possible at Whistler and further study is required in the Lower Cheakamus. All options under study in the Lower Cheakamus will avoid the North Vancouver Outdoor School.

SECTION 1.0 INTRODUCTION

1.1 Purpose of Report

This report has been prepared by B.C. Hydro to describe the present status of the environmental and technical aspects of planning and design for the second Kelly Lake to Cheekye 500kV transmission line after completion of the 1989 field studies and public consultation. It also presents the key findings of B.C. Hydro's consultants from the public consultation and environmental studies. The report provides a comparative analysis of all alternative routes and identifies what appears to be a generally acceptable route, at this time. The report is intended to meet the preliminary planning stage of the information requirements of the Energy Project Review process of the B.C. Ministry of Energy, Mines, and Petroleum Resources.

This report is being circulated to all levels of government, to Indian Bands, and to all parties expressing interest in the project, as a sequel to the Prospectus for the project issued in September 1989. B.C. Hydro is planning to meet with the Indian Bands and to undertake further public consultation after release of this report. The nature of the next round of the consultation program will reflect the comments received on this report.

1.2 Project Description and Purpose

It is B.C. Hydro's proposal to construct a second 500 kV single circuit transmission line between Kelly Lake Substation, near Clinton, and Cheekye Substation, near Squamish, a distance of approximately 200 km, dependent on route selection. The line would be known as circuit 5L46.

The route to be used by the project has not been determined. The network shown in Figure A, within which is expected to be found the final route, has been reviewed in the current set of studies. An influence on route selection is that B.C. Hydro proposal to remove transmission line 2L1 from Shalalth to Cheekye as part of this project. Its ROW would then be available for use by this project, where appropriate.

Transmission planning studies have shown this project to be the most effective way to increase the transmission capacity of the electrical transmission system from the Interior to the Lower Mainland while maintaining acceptable levels of reliability. The rationale for studying the project comes from the forecast increase in demand for electricity in the Lower Mainland and on Vancouver Island for the next ten to twenty years. Based on present expectations of growth, transmission reinforcement is expected to be required in the mid-1990s. Figure D shows B.C. Hydro's existing 500kV transmission system.

Because of the forecast increase in demand, it is B.C. Hydro's intention to submit an application for an Energy Project Certificate for this project in 1990 so that it will be possible to meet a 1995 in-service date if required. If demand is less than expected, the scheduled 1995 in-service date could be postponed.

SECTION 2.0 RECENT STUDIES & PROGRAMS UNDERTAKEN BY B.C. HYDRO

2.1 Technical

Since this project was reactivated in 1989, B.C. Hydro has reviewed the technical feasibility of all the routes in the network shown in Figure A. All sections of potential routes identified as being of public concern in earlier studies have received further study.

Helicopter reconnaissance confirmed the technical feasibility of use of any part of the route network shown in Figure A. Colour and black and white aerial photography of the network was completed in August 1989 at scales of 1:10,000 and 1:25,000 respectively to assist field studies and future surveys. A winter inspection has been made of the mountain passes west of Whistler.

Self supporting and guyed steel towers would be used, either using B.C. Hydro's present flat configuration or a new delta configuration, both are shown in Figure B. Comparison of the flat and delta configurations for the conductors continues, and no firm decision has been reached. The delta configuration offers some electrical benefits, and a reduction of clearing width of 10 metres, but at some extra cost and a nine metre increase in height. It is physically possible to switch from delta to flat configuration between towers to reduce height and visibility, but the electrical consequences of this have not yet been determined.

The standard ROW width adopted by B.C. Hydro for a new 500 kV line is 64 metres (210 feet). However for this project an existing 61 metre (200 feet) ROW exists for much of the length. B.C. Hydro therefore proposes to use a 64 metre ROW where new ROW is required but to adapt to the 61 metre wide ROW where it is to be used. The proposed ROW and clearing widths for each conductor configuration are shown in Figure C.

B.C. Hydro recognizes that transmission line routing in the Birkenhead River Valley has resulted in congestion and high visual impact. It is continuing to review possible improvements in this segment.

KELLY LAKE - CHEEKYE

500 kV TRANSMISSION LINE PROJECT STRUCTURE TYPES

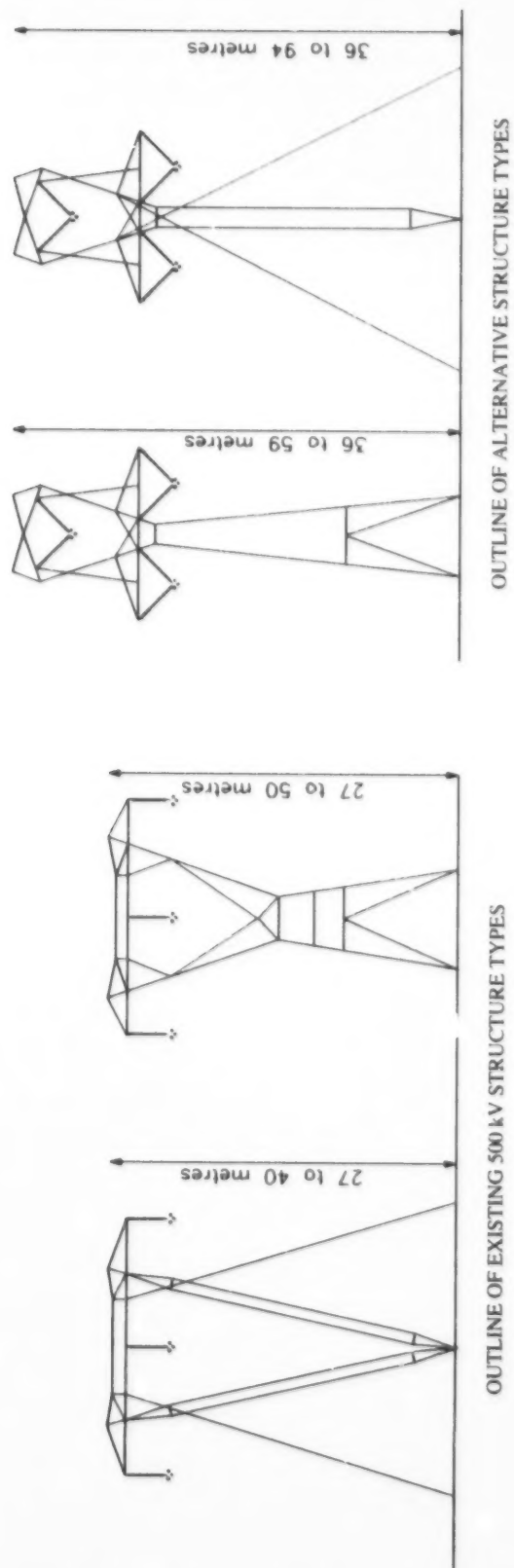
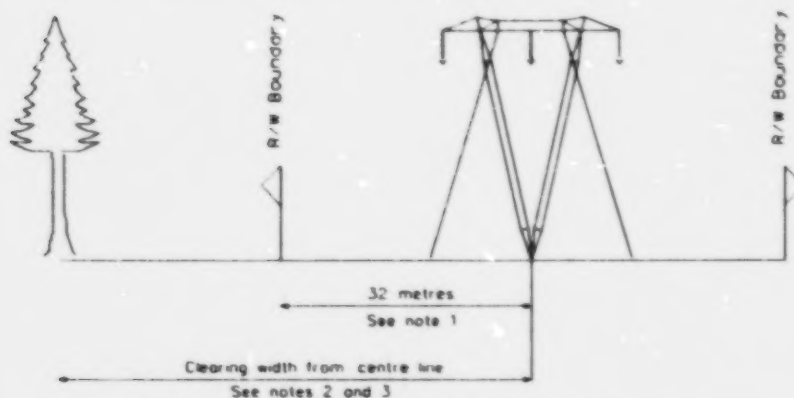


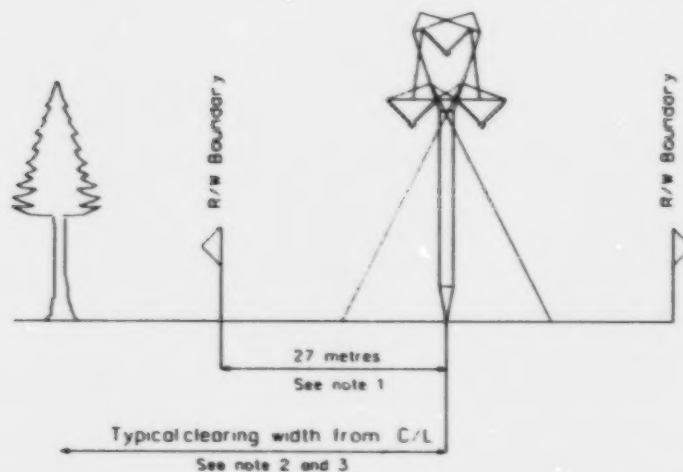
FIGURE C

KELLY LAKE - CHEEKYE
500 kV TRANSMISSION LINE PROJECT
TYPICAL R/W AND CLEARING WIDTHS

FLAT CONDUCTOR CONFIGURATION



DELTA CONDUCTOR CONFIGURATION



NOTES

- 1) Where existing 2L1 R/W is utilized, R/W edge distance is 30.5 m.
- 2) Clearing widths are a function of several factors including; tree height, ground slope, tree species, site growing conditions, conductor height above ground, and free health
- 3) Typical anticipated clearing widths from centreline are as follows:

i) 50 metres for FLAT CONFIGURATION with...	-30 metre tree height, -level ground -11 metre conductor height.
ii) 45 metres for DELTA CONFIGURATION with..	-30 metre tree height, -level ground. -11 metre conductor height
iii) 26 metres for FLAT CONFIGURATION with...	-15 metre tree height -30 per cent ground slope -11 metre conductor height
iv) 21 metres for DELTA CONFIGURATION with...	-15 metre tree height -30 percent ground slope -11 metre conductor height

At Pemberton one land-owner has requested a review of routing adjacent to 5L42 and the various options are being studied.

In the Lower Cheakamus River Valley a group of residents has petitioned B.C. Hydro to locate 5L46 off the 2L1 ROW. Alternative routes are reviewed in this report. Further studies are also ongoing at Whistler in an effort to identify an agreed on route.

2.2 Environmental

The current environmental studies, including both biophysical and social components, are the third in a series on this project with earlier studies being completed in 1981 and 1984. The 1981 studies were undertaken by Sigma Resource Consultants and done in conformity with the 'Guidelines for Linear Development'. They concluded that it was preferable to use the existing transmission corridor. The documented response of the Provincial Government has not yet been located, but it is believed to be acceptance of the conclusion.

The second set of studies was completed by Cypress Resource Consultants in 1984. This set was designed to identify an alignment within the corridor determined in the 1981 studies, and to conform to the information requirements of the Energy Project Review Process. As the project was deferred by B.C. Hydro in 1984 the Cypress report was not issued at that time. It has since been released as a reference report and the conclusions reached in it on an alignment have been used as the starting point for identification of an alignment in the existing corridor.

The intent of the current biophysical studies is to update existing information and to provide data on sections of the network not included in the earlier studies. These studies include reviews of terrain, vegetation, wildlife, forestry, agriculture, fish, recreation, aesthetics and heritage resources.

The social impacts of the project are being assessed by the consultant who is also reviewing land use along the route network, with the intent of identifying present and possible future conflicts. This consultant has met with all agencies responsible for land use planning within the route network area, including provincial, regional and municipal governments. In addition, there have been informal meetings of project leaders with the Bridge River, Seton Lake, Anderson Lake, and Mount Currie Indian Bands to review their concerns about possible effects on their lands. The social component will not be complete until there have been formal meetings with all Band Councils to review the project. Negotiations continue to achieve this objective.

All environmental consultants are also seeking to determine specific situations which may require mitigation and to examine ways to achieve this. The environmental studies have been fully integrated with an active public consultation program.

2.3 Public Consultation

The public consultation program for the Kelly Lake - Cheekye Project began in April 1989 in conjunction with environmental and technical studies. The main objectives of the program are: to foster broad based understanding of the need for the transmission line and the planning process; to provide opportunities for ongoing information exchange between project area residents and B.C. Hydro; and to stimulate public discussion of alternative routes. The area of public consultation stretches from Clinton to Squamish, it includes these two communities as well as Lillooet, Seton/Shalalth, D'Arcy, Birken, Pemberton, Mt. Currie, and Whistler. Phase 1 consultation activities involved the development of a detailed public consultation plan. This plan outlined a number of major task areas which were implemented by the Project Team as follows:

- project planning and project announcement;
- initial meetings with municipal/regional governments and B.C. Hydro District Office personnel;
- one to one consultation;
- preparation of information materials;
- consultation with special interest groups and community organizations;
- contact with native bands;
- regional open houses;
- ongoing consultation as required.

Initial Meeting:

A series of initial meetings were held in the study area, with the Squamish Lillooet Regional District, the Municipal Councils of Clinton, Lillooet, Pemberton, Whistler and Squamish. Meetings were also held with the local B.C. Hydro Customer Services and Production employees.

The Municipal representatives were very helpful and informative in highlighting possible areas of concern, types of impacts that could be priorities with local residents and suggestions for mitigation/compensation strategies.

One to One Consultation:

One to one consultation was undertaken with a number of key local residents with respect to recent planning and development issues in the area and, more specifically, about the proposed transmission project.

Personal and telephone interviews were conducted with 70 local people who are actively involved in local issues.

Public Information Materials:

In preparation for the first public meetings, various types of public information materials were prepared as follows:

- **Press Releases:** two press releases were issued by B.C. Hydro in June 1989 to the local area as well as Lower Mainland newspapers.
- **Information Centres:** within the study area, libraries and government offices housed project-related information (reports, maps etc.) for the public to review.
- **Project Newsletter:** a four page newsletter outlining project history, the public consultation process, technical/environmental studies underway, routes being considered, a toll free telephone number and a mail-in coupon was distributed to every household in the region prior to the project Open Houses.
- **Other Information:** at the project Open Houses visual and informational materials were available to the public including display boards, Project Prospectus, brochures on vegetation management and Power Smart programs etc.

Special Meetings:

B.C. Hydro's Project Team met with individuals and groups in the study area who had a special interest in the proposed project. Area residents were given opportunities to ask questions, voice concerns and receive feedback from B.C. Hydro.

Examples of individuals/groups who met with the Project Team include:

- **Interest Groups** including members of the Whistler business community and a parents group in Pemberton
- **Yalakom Valley/Antoine Creek Valley Residents** (November, 1989)

Contact with Native Bands:

There are eight Bands who could potentially be affected by this proposed transmission line depending on the route that is chosen. They are the Mount Currie, Pavilion, Squamish, Lillooet, Anderson Lake, Seton Lake, Whispering Pines and Bridge River Bands.

Generally, the interest expressed by these Bands in participating in the public consultation process has been minimal. Most Bands have been personally contacted by representatives from B.C. Hydro. Initial meetings were held with Mount Currie, Pavilion Band, Bridge River, and Anderson Lake Indian Bands. The Seton Lake Band hosted an Open House which is noted below. Whispering Pines Band has yet to be contacted, but has been sent full project information.

At the time of preparation of this report the Indian Bands, including those of the Lillooet and Squamish Tribal Councils, had not yet agreed to discuss the project, and have limited their involvement to gathering of information. No band has refused to discuss the project, but starting such discussion has been complicated by the need to negotiate issues related to existing transmission lines across some reserves in the project area.

As a result all route options shown near reserves are tentative. No attempt has yet been made by B.C. Hydro to negotiate for new ROW with any Band. B.C. Hydro continues to seek to brief the Indian Bands that might be affected by the project and to negotiate with any Band where ROW may be required. Steps are now being taken to assess options around reserve land.

Open Houses:

A total of eight Open Houses were held in the first two weeks of October, 1989 in the communities of Clinton, Shalalth, Lillooet, Pemberton, Birken, Whistler, Squamish and the Seton Lake Band.

Interest in the project seemed to be most pronounced in Lillooet, Pemberton, Birken and Squamish. Generally, the attendance was, on the average, lower than anticipated with a total of 297 persons for all eight Open Houses.

The types of concerns and questions raised at the Open Houses were similar to those that emerged during initial meetings and the interviews for the community profile.

Consultation will continue in 1990 in response to the comments received following issue of this report.

SECTION 3.0 ENVIRONMENTAL FEATURES OF NETWORK SEGMENTS

The important features of each segment of the route network and the key environmental issues within each, are as follows, using the segment names and node letters shown in Figure A.

3.1 Kelly Lake (AB) (6 kilometres)

The segment starts at the substation and rises over forested slopes to the Pavilion plateau. The route uses an existing uncleared ROW to the east of existing transmission lines 5L41, 5L42, 2L90, and 2L91. The key issues are:

- Increased visual impact of widening cleared width from 120 metres to 180 metres.
- Loss of 36 hectares productive forest land.

3.2 Antoine (BG) (44 kilometres)

The segment leaves the existing transmission lines on Pavilion Mountain heading west to cross the Fraser Canyon. It continues west to cross the Camelsfoot Range near Slok Hill, where it turns south to descend to the Bridge River crossing through the Antoine Creek Valley. From the Bridge River it continues south, rising to join the 5L42 ROW on Mission Ridge.

The key issues are:

- Adverse impact on heritage sites at Arden Park in Kelly Creek Valley, and at Kelly Creek IR 3 where there are important old Indian village sites.
- Development of road access into California bighorn sheep winter range in Cavanagh Creek Valley and Fraser Canyon.
- High terrain impacts in Cavanagh Creek Valley.
- New isolated crossing of Fraser Canyon with implications for aircraft safety, and high visual impact for river users.
- Loss of productive forest land on Camelsfoot Range.

- High terrain disturbance and visual impact resulting from construction on steep ridges in Antoine Creek Valley, where revegetation will be very difficult.
- Intrusion into natural landscape of Antoine Creek Valley which is the home of a group of people determined to maintain a way of life close to nature, and which is likely to remain a natural landscape due to limited forest and difficult terrain.
- Disturbance during construction and operation of line on mountain goat, bighorn sheep, and deer populations of Antoine Creek Valley.
- Visual impacts at crossing of Bridge River near attractive Camelsfoot Bend.
- Loss of productive forest land on north side of Mission Ridge.

3.3 Pavilion (BCEF) (29 kilometres)

This segment runs south from B over the Pavilion Mountain rangelands using an existing unused ROW on the east side of transmission lines 5L41, 5L42, 2L90, and 2L91. At C within the Pavilion Indian Reserve it turns west, requiring new ROW to cross 5L41, 2L90, and 2L91 and to continue adjacent to the south side of 5L41 across the Fraser Canyon. It then turns south and lies adjacent to the east side of 5L41 in a long rising traverse of the east side of the Camelsfoot Range before descending to F in the Bridge River Indian Reserve.

The key issues are:

- Incremental visual impact on the scenic rangelands on Pavilion Mountain.
- Incremental impacts on grazing lands of Diamond S Ranch and use of Pavilion Indian Reserve.
- The crossing of the Fraser River is adjacent to the existing crossing, resulting in a single crossing with less risk to aircraft, and only incremental visual impact.
- Incremental visual impact in view of Camelsfoot Range from highway between Lillooet and Pavilion.

Sub-option CDE starts at C in which the segment would continue south of C on existing

ROW through the Pavilion Indian Reserve turning west at D to cross the Fraser Canyon and rejoin 5L41 at E.

The key issues associated with sub option CDE are:

- Avoidance of the need for new ROW on Pavilion Indian Reserve.
- Higher visual impact at crossing of Fraser Canyon and increased hazard to light aircraft as a result of separation of crossings.
- Interference with wheeled irrigation system for Diamond S hayfields south of Pavilion.
- Visual impacts of two crossings of highway within 1.5 kilometres with no screening of line by trees.

3.4 Mission (FG) (15 kilometres)

The segment rises from the Bridge River at F to the top of Mission Ridge at G and lies adjacent throughout to the south side of 5L42.

The key issues are:

- Loss of productive forest land.
- Difficulty in revegetation over 2.5 kilometres in alpine areas, resulting in possible erosion.
- This is an area where heavy icing of conductors and towers can occur, but standard construction is considered adequate for new line in light of experience with 5L42, for which extra heavy special construction was used to cross Mission Ridge.

3.5 Anderson (GH) (37 kilometres)

As part of this project B.C. Hydro proposes to remove transmission line 2L1 in its entirety from Shalalth to Cheekye with its ROW then being available for 5L46. Thus in this segment the 2L1 ROW is available for the new project, south of Seton Portage.

For 15 kilometres the segment descends from G, adjacent to the south side of 5L42, in a long sidehill traverse above Shalalth and Seton Portage, then crosses 3L2 and 2L2 to the west of Seton Portage to reach the existing 2L1 ROW. This ROW is used for 18 kilometres along Anderson Lake to D'Arcy. Here the segment diverges for 4 kilometres from the 2L1 ROW to lie higher up the slope adjacent to 2L2 until it meets the south side of 5L42 where the latter crosses over 3L2 and 2L2 at H.

The key issues are:

- Difficult conditions for revegetation for 5 kilometres in alpine areas on Mission Ridge and on dry slopes above Seton Portage.
- Desirability of avoiding the small area of developable land at Seton Portage.
- Protection of water quality in many domestic supplies between Seton Portage and D'Arcy.
- Reduction of visual impacts of transmission lines at Seton Portage and D'Arcy.
- Future status and management of B.C. Hydro's Highline Road from Seton Portage to D'Arcy.

3.6 Gates (HJ) (28 kilometres)

This segment goes westward in the narrow Gates River Valley for 14 kilometres from H, then turns south in the Birkenhead River Valley for 14 kilometres to J. In the Gates River Valley the route would leave the 2L1 ROW about 2 kilometres from H, rise high on the south side of the valley and then descend in a long traverse for 12 kilometres to return to the 2L1 ROW west of Gates Lake. For a 3 kilometre portion of this section it would lie adjacent to the south side of 5L42.

In 1983 there was much interest in this section of the line due to the proximity of many homes to the existing transmission lines. The intent of this diversion is to reduce the visual and land use impacts of the new line relative to the impacts of use of the existing 2L1 ROW.

The use of the 2L1 ROW is presently proposed in the Birkenhead River Valley, although it is recognized by B.C. Hydro that this is a section warranting further detailed study to reduce visual impacts, if this route is finally selected.

The key issues are:

- Reduction of land use constraints on narrow valley bottoms where settlement occurs.
- Protection of water quality in Gates River and its spawning channel, and Birkenhead River where there are high fish values.
- Reduction of visual impacts in settled areas and at Gates Lake.
- Continued impact on potential use of small Lokla Indian Reserve of Mount Currie Indian Band, which is also traversed by 2L2, highway, and railway.

3.7 Duffey (FJ) (89 kilometres)

From F in the Bridge River Indian Reserve the segment runs southeast for 1 kilometre to meet 2L90 and 2L91. It then follows these south for 6 kilometres adjacent to their west side through the Lillooet Indian Reserve to Town Creek, here it diverges from 2L90 and 2L91 to the west for 2 kilometres to rise over a prominent rock ridge on the north side of the Seton River Valley.

It then crosses the Seton River Valley and enters the canyon of Cayoosh Creek which it follows for 13 kilometres. This is a very difficult section due to the terrain. From the upstream end of the canyon the segment continues south and west for 45 kilometres to Cayoosh Pass using the south and east sides of the Cayoosh River Valley and passing Duffey Lake on the way.

At Cayoosh Pass the segment turns south descending the west side of Joffre Creek Valley for 9 kilometres before turning west above the head of Lillooet Lake. It continues westwards on sidehill for 3 kilometres to a junction with 3L2 which it then follows, adjacent to its north side, for 10 kilometres to meet the 2L1 ROW near Creekside. In this last section 7 kilometres would be within Mount Currie Indian Reserves 6 and 7.

The key issues which have been identified are:

- The Squamish Lillooet Regional District objects to this route as impairing a highly scenic section of the new tourist highway route from Vancouver to Lillooet.

- The Village of Lillooet considers the proposal would have an adverse effect on the village as there is no vegetation west of the village to screen the lines, and because its visual impact might affect tourist appeal of the Duffey Lake highway which is run as an important asset to the village.
- The line would interfere with irrigation on hayfields north of Lillooet.
- The Mount Currie Indian Band do not want another transmission line through their major reserve, and adjacent to their newly developed village.
- The loss of forest production in Cayoosh River Valley, upstream of the canyon, and in Joffre Creek Valley, would be high because of the high average site quality.
- The terrain hazard in the Cayoosh River Valley, in terms of avalanches and rock slides, is high.
- Adverse impact on existing Joffre Lakes recreation area and proposed provincial park at Duffey Lake.
- High visual impacts in Cayoosh Canyon.
- Important mountain goat and grizzly bear habitat would be affected in the Cayoosh River Valley, and construction and operation of the line would disturb wildlife.

3.8 Pemberton (JK) (10 kilometres)

For 4 kilometres south of J to the north side of the Lillooet River Valley the segment uses the 2L1 ROW, which lies between 2L2 and 5L42. Here it leaves the 2L1 ROW and crosses the valley adjacent to the northwest side of 5L42 following it over Signal Hill for a total of 5 kilometres. Near K it crosses 5L42 and uses a new ROW for 1 kilometre on the east side of the Green River Valley.

The key issues are:

- There is a desire to move transmission lines out of the village of Pemberton to allow better planning of the limited developable land above the flood plain. A route adjacent to 5L42 with release of 2L1 ROW within the village achieves this.

- Interference with farming operations near Pemberton.
- Concern over impact on views from Lillooet River Valley.
- Proposed route reduces visual clutter of transmission lines on approach to Pemberton from south, including at One Mile Park, by removal of 2L1 for 4 kilometres.

3.9 Birkenhead (HI) (20 kilometres)

This segment runs west from H for 12 kilometres on the south side of the Blackwater River Valley. It then runs southwest and traverses Birkenhead Provincial Park for 8 kilometres on the forested slopes above the southeast side of Birkenhead Lake.

The key issues are:

- Ministry of Parks and many local residents are very concerned at high visual impact of traverse of Birkenhead Lake Park through mature forest on mountain side, well above lake, and at disturbance of wildlife within park from construction and operation of line. Reduction in park values.
- Loss of 72 hectares of productive forest land outside park.

3.10 Owl (IK) (25 kilometres)

This segment crosses the Birkenhead River Valley, rises steeply onto the sub-alpine and alpine ridges in the Fowl and Owl Creek drainages, then descends steeply into the Lillooet River Valley due north of Pemberton. It then crosses the farmland in an area with considerable settlement and skirts the western and southern sides of the village of Pemberton.

The key issues are:

- Visual impacts for small community at south end of Birkenhead Lake.
- Impacts of construction and operation of line in proposed provincial park in sub-alpine and alpine areas of Owl and Fowl drainages, including visual impact, wildlife disturbance, and loss of wilderness character.

- High visual impacts of ROW on descent into Lillooet River Valley, and of hillside traverse above Pemberton.
- Impacts on settlement and farming operations of crossing of farmlands near Pemberton.
- Water quality concerns from crossing of watershed area for Pemberton, due to clearing and maintenance of ROW.
- High visual impact of another ROW across main activity area of Nairn Falls Provincial Park.
- Use of this segment with Birkenhead segment would remove 2L1 from 39 kilometres of existing corridor.

3.11 Green (KL) (2 kilometres)

This short segment is on the eastern forested side of the Green River Valley.

The key issues are:

- Removal of 2L1 for 2 kilometres along highway and at entrance to Nairn Falls Park.
- Loss of 12 hectares of productive forest land.

3.12 Soo (LM) (18 kilometres)

The first 4 kilometres of this segment is an angled crossing of the Green River Valley. The segment continues southwest for 6 kilometres on a descending sidehill traverse into the Soo River Valley. Near the crossing of the Soo River the segment turns west and follows the logging road along the south side of the wetlands for 6 kilometres. It then rises for 2 kilometres to M on the ridge overlooking the pass west of Rainbow Mountain.

The key issues are:

- Visual impact from Highway 99 of crossing of Green River Valley, especially on west side.

- Loss of 108 hectares of productive forest land.
- Visual impact in Soo River Valley which will probably become an important recreation access corridor for both winter and summer recreation based in Whistler.
- Disturbance to wildlife from construction and operation of transmission line close to wetlands. The latter are an unusual and important feature in Coast Mountains.
- Use of this segment with Rainbow segment would result in removal of 2L1 for 37 kilometres between L and N through Whistler.

3.13 Ryan (IM) (57 kilometres)

This segment crosses the Birkenhead River Valley at the south end of Birkenhead Lake and rises westwards up the valley of Tenas Creek to Ogre Lake (10 kilometres), crosses the alpine ridges at the head of Owl Creek (3 kilometres), descends steeply into the Lillooet River Valley (3 kilometres), crosses the farmlands (2 kilometres), rises steeply on a ridge at the mouth of Ryan Creek (1 kilometre), and ascends the valley of Ryan Creek and a southerly tributary to climb to the alpine ridge at the divide (18 kilometres).

From there it continues southward descending the valley of Rutherford Creek (11 kilometres) before rising steeply to cross the ridge between Rutherford Creek and the Soo River (3 kilometres). From the crest of this ridge it angles southwest across the wide Soo River valley to M on the ridge at the entrance to the pass west of Rainbow Mountain (6 kilometres).

The key issues are:

- Visual impact near settlement at south end of Birkenhead Lake.
- Intrusion into scenic wilderness area at head of Tenas and Owl Creeks proposed by Ministry of Parks for a provincial park, and disturbance of mountain goat and other wildlife in this area.
- Interference with farming operations on arable ground in Lillooet River Valley.
- High visual impacts on descent into, and ascent from, Lillooet River Valley.

- Loss of 240 hectares productive forest land in valleys of Tenas, Ryan, and Rutherford Creeks, and Lillooet and Soo Rivers.
- High level of risk from avalanches and rock slides in headwater area of Ryan Creek.
- Effects on local grizzly bear and mountain goat populations of construction and operation of line in the upper valleys of Ryan and Rutherford Creeks, and Soo River Valley.
- Visual impact on attractive alpine ridge north of Soo River and in Soo River Valley which will become an important recreation access corridor for Whistler, and in Heliski areas.
- Use of this segment with Rainbow and Birkenhead segments would result in removal of 2L1 for 98 kilometres from existing corridor.

3.14 Rainbow (MN) (23 kilometres)

This segment runs south from M, descending from the ridge to the valley floor at the pass west of Rainbow Mountain (4 kilometres). From the pass it continues south through the forest lands of the Lower Callaghan River Valley to skirt the west side of Brandywine Provincial Park and return to the 2L1 ROW at N just south of the park (19 kilometres).

The key issues are:

- Crossing of Rainbow/Callaghan Lake alpine area, often viewed as providing future opportunity for expansion of winter and summer recreation at Whistler.
- Loss of 110 hectares of productive forest land in Callaghan River Valley and visual impact in this valley which is seen as an important recreation access corridor in the future.
- Ministry of Crown Lands is concerned about visual impact for heliski visitors, and safety to helicopters using Rainbow Pass.
- Use of this segment with Soo segment would allow removal of 2L1 for 37 kilometres through Whistler, including north and south approaches, and from Brandywine Provincial Park.

- Rainbow Pass is subject to avalanches and rock slides but a safe route is feasible.

3.15 Whistler (LN) (37 kilometres)

This segment descends from L along the east side of the Green River Valley (3 kilometres) to meet 5L42. It continues south adjacent to the east side of 5L42 for 4 kilometres, then crosses it to regain the 2L1 ROW which it follows through Whistler, apart from a short diversion at a kink south of Green Lake, to a point on the bench above the west side of Alta Lake (17 kilometres). It then leaves the 2L1 ROW heading southwest to join 5L42 (3 kilometres) and follows 5L42 for 2 kilometres lying adjacent to its north side to a crossing point about 1.5 kilometres west of the sewage plant. Here it turns southward, and rises over a forested ridge before descending again to cross the eastern fringes of Brandywine Park, 5L42, and the head of Daisy Lake to return to the 2L1 ROW (8 kilometres).

The key issues are:

- Desire to reduce visual impact of transmission lines adjacent to developed areas, and throughout Whistler and its approaches, particularly from the south. Use of this segment removes 2L1 for 8 kilometres along the highway south of Whistler and for 8 kilometres north of Whistler.
- Concern for protection of wetlands between Alta and Green Lakes. Use of this segment would result in disturbance of the wetlands during construction but would require no further clearing.
- Desire to reduce interference with recreation potential on valley floor between Whistler and Daisy Lake. Use of this segment would remove 2L1 from entrance and high use area of Brandywine Park.
- Use of this segment would avoid changes to wilderness and recreation lands on the west side of Whistler until management plans are developed for the area.

3.16 Upper Cheakamus (NP) (13 kilometres)

This segment runs south from N using the 2L1 ROW (9 kilometres) to a point near the head of the Cheakamus Canyon. Here it leaves the ROW, and ascends to a high bench on the west side of the canyon, which it follows south to P.

The key issues are:

- Reduction in visual impact at head of canyon by removal of 2L1 at the cost of some impairment of more distant views as a result of location on west side of canyon.
- Use of 2L1 ROW past Pinecrest and Blacktusk Village will minimize impacts of construction and operation on these sub-divisions.

3.17 Lower Cheakamus (PT) (15 kilometres)

This segment descends from P to the floor of the Cheakamus River Valley at Q (2 kilometres) where it meets the 2L1 ROW and uses this through R to T (13 kilometres). There are three sub-options considered in the segment as a result of local concerns on project routing. The west sub-option PR (10 kilometres) traverses the forested sidehill on the west side of the valley to reduce use of the valley floor. The south sub-option RST (7 kilometres) rises onto the rocky ridges on the east side of the valley to avoid the North Vancouver Outdoor School and the Cheakamus Indian Reserve. The east sub-option QS (8 metres) rises onto rocky ridges on the east side of the valley to reduce use of the valley floor.

The key issues are:

PQRT

- Local residents have requested B.C. Hydro not to use existing ROW because of alleged effects of existing transmission line.
- Legal status of B.C. Hydro's access road in this section on which local residents depend.
- Existing 2L1 ROW is very close to buildings of North Vancouver Outdoor School. Further clearing may be necessary for 500 kV line, depending on conductor formation to be used, this would reduce screening of school from road and remove some prized old trees.
- B.C. Hydro does not have a legal ROW across Cheakamus Indian Reserve.

PR

- High visibility from Highway 99, detracting seriously from magnificent view of Tantalus Range from highway.
- Clearing of 10 kilometres of new ROW on steep hillside in high rainfall area would result in erosion and siltation of Cheakamus River, highly valued for its fishery.

RST

- Use of this sub-option avoids the North Vancouver Outdoor School and the Cheakamus Indian Reserve.
- The ascent from R to the rocky bench above the valley will be visible to southbound travellers in the Cheakamus Valley. As very little clearing is anticipated because of the rock bluffs the impact should be low.
- The line can be located on the higher ground near S so that it is not seen from Highway 99, Brohm Lake, or Cheakamus River Valley.
- A site of an event in a myth of the Squamish Indians is reported at the bluffs north of S.

QS

- About 3 kilometres of this sub-option is close to Highway 99 and highly visible. It would severely impact views west from the highway to the Tantalus Range.

SECTION 4.0 RESULTS OF PUBLIC CONSULTATION PROGRAM TO DATE

This section highlights the public concerns and issues associated with the proposed Kelly Lake - Cheekye project that have been identified to date. These concerns and issues were identified by the public in the forums highlighted in Section 2.3 of this report (initial meetings/one to one consultation/open houses/contact with native bands).

It must be emphasized that, to date, contact with Indian Bands and Tribal Councils in the study area has been limited to the extent that Councils and Bands wished to participate; hence, their concerns have only been partially identified in this report.

The Lillooet Tribal Council, on behalf of its member Bands, has recently written to B.C. Hydro and stated that it has chosen not to participate in the corporation's public consultation program for the proposed project and does not require information regarding the program. The Tribal Council proposed establishment of a formal structure for negotiations. They want to see some evidence that B.C. Hydro is dealing with outstanding grievances (mainly over rights to property and access).

Many of the issues raised as part of the environmental assessment presented in Section 3.0 of this report were identified as concerns by the public in the study area.

The public concerns described below are organized into two categories: general and route related. The order of the concerns does not reflect their relative importance. A breakdown of the concerns expressed by the individual communities in the study area follows the General Concerns/Issues section.

Community Specific Issues/Comments:

Highlights of the project related issues/comments raised at meetings with the various communities, as well as in correspondence, are documented in general terms below.

Clinton:

- creation of local economic benefits (clearing and construction jobs);
- potential risks of electric and magnetic field;
- use of pesticides on ROW;
- few direct local benefits from the project (lost timber values);
- need/justification for this transmission line;
- visual impacts of the proposed transmission line;

- energy efficiency of existing facilities;
- no route preference stated by Municipal Council.

Lillooet:

- protection of the scenic qualities of the Duffey Lake Road for tourism;
- protection of wilderness areas should be balanced by potential costs on settled areas;
- potential risks to human and animal health from electric and magnetic fields;
- anticipate economic benefits from the proposed project;
- suggest that B.C. Hydro should curb increasing demands for power by developing more conservation programs and increasing rates;
- support the concept of ROW vegetation management;
- visual impacts of transmission lines;
- assurances that B.C. Hydro would clean up felled timber in the ROW;
- foregone agricultural potential of land crossed by transmission lines;
- investigations into alternate energy sources;
- more visible role for B.C. Hydro by organizing and participating in community affairs;
- Municipal Council prefer that the existing ROW be used and Duffey Lake be avoided.

Yalakom Valley/Antoine Creek Valley Residents:

- representatives of a community situated in the Yalakom Valley/Antoine Creek Valley, attended the Lillooet Open House to express their opposition to the possibility of the transmission line construction along the Antoine route segment;
- subsequent to the Open House, a meeting was held with area residents in which they re-iterated this position.

Seton/Shalaith:

- desire to see B.C. Hydro contribute to the upgrading and maintenance of the Hilina Road which links Seton/Shalaith to Pemberton;
- B.C. Hydro should consider compensation to small rural communities that bear the costs of transmission line development;
- possibility of using the ROW for agriculture and/or horticulture;
- anticipate that proposed project would bring new residents to the community;
- residents are generally supportive of the use of the existing ROW.

Seton Indian Band:

- desire to discuss specific resource issues and impacts with B.C. Hydro's environmental consultants;
- new ROW will further expose traditional land uses to intrusion by non-natives;
- need for a long term plan to deal with general development pressure in the region;
- support for the improvement and year round maintenance of the Hiline Road;
- support for the removal of 2L1 near their lands;
- Band did not state a preferred routing option.

Pemberton:

- potential drop in property values and disruption of land and activities along the proposed ROW;
- visual impacts of transmission lines;
- potential risks to farm animals and human health from EMFs and herbicides;
- desire to remove transmission lines near the local elementary school;
- agricultural potential foregone by transmission line development;
- concern that B.C. Hydro has already selected a preferred route;
- queries about justification for the proposed project;
- concern over the safety and monitoring of PCB storage at Creekside;
- Mount Currie Band registered concern that traditional activities would be detrimentally affected by another transmission line;
- B.C. Hydro to clarify the issues of power export and specifically whether this proposed project would transmit power for export;
- potential negative impacts for tourism activities;
- route preference not stated by Municipal Council.

Birken:

- some opposition to the predominant view that the Duffey Route is not an acceptable option;
- negative impacts on property values and on visual resources;
- fair compensation for timber values that could be lost through new ROW clearing;
- opposition to energy development for export;
- feeling that B.C. Hydro has not responded adequately to local concern about safe storage of PCBs;
- potential health effects of EMFs;

- residents appear to prefer the alternative which involves a possible replacement of an existing line with minor variations on route location for certain property owners; avoid Birkenhead Park.

Whistler:

- visual impacts of another transmission line;
- issues of project justification, power export and B.C. Hydro's commitment to conservation programs;
- no direct benefits for local areas;
- implications of the Meager Creek development or other independent power developments for the Kelly Lake - Cheekye Line;
- potential health effects from EMFs;
- residents who attended the Open House favoured the new line to follow the existing route;
- Whistler Council has not stated a preferred route.

Squamish:

- potential effects of herbicides (used for ROW clearing and maintenance) on domestic water supplies;
- impact on private property values adjacent to the ROW and loss of land;
- require justification for the project;
- perceived inequitable distribution of costs and benefits associated with energy project development;
- potential for local economic benefits;
- concern expressed regarding the visual impacts of transmission lines;
- role of independent power producers;
- concern about the potential health effects of EMFs;
- the North Vancouver Outdoor Recreational School expressed opposition to use of the existing transmission line due to impacts on the facilities and programs;
- no increase in size of Cheekye Substation is perceived as positive;
- most residents in the Cheakamus Valley appeared to favour the alternative route which would replace an existing 230 kV transmission line, with the condition that the new line deviate in places from the existing ROW in the Lower Cheakamus Valley;
- at the Squamish Open House, Upper Cheakamus Valley residents presented B.C. Hydro with a petition signed by about 30 residents of the Valley stating their opposition to the proposed route using the existing ROW.

Squamish - Lillooet Regional District:

- Squamish-Lillooet Regional District includes all of the study area communities except Clinton;
- preferred routing is the existing corridor, if the project is built, rather than crossing the relatively undisturbed landscapes such as Duffey Lake, the Soo Valley and Callaghan Creek.

General Concerns/Issues

Project Justification and Power Export

A major issue throughout the study area is the justification for the Kelly Lake-Cheekye line, as opposed to alternative lines in other areas, or no new lines. There has also been considerable discussion about power export; some of the public generally supports the merits of exporting power from existing plants at times of water surplus, but opposes the export of firm power. Questions were raised as to whether this project would actually be built to supplement export of firm power and why such export is even considered as an option if domestic demand is increasing. Opposition to the concept of firm power exports was recorded consistently in the public consultation program, mainly on the grounds that small rural communities are becoming increasingly unwilling to bear the costs of power generation and transmission for the benefit of people in another country. Closely associated with project justification and export, is the question of the degree of commitment that B.C. Hydro has made to conservation (programs like Power Smart). Many people in the study area expressed the opinion that far greater efforts should be made, and that B.C. Hydro should change its rate structure to further encourage conservation of energy.

Electric and Magnetic Field (EMF) Effects

A second predominant concern is the perceived potential for risk to human (and to a lesser extent farm animal) health from EMF effects. Concern is heightened by the perception that risk is increased from cumulative effects (there are three to four lines running through several parts of the study area) and from upgrading to a higher voltage line. Generally, people want to know more about this topic and some would prefer to receive information from a source more "neutral" than B.C. Hydro. There are specific concerns about EMF effects near private homes and schools (in Pemberton and near Squamish).

Visual Impacts

Several residents feel that the proposed project would have an adverse effect on the aesthetic values of the area and hence tourism activities, especially around Whistler and Pemberton. (The preference stated by many of the public for the Anderson Lake rather than Duffey Lake route is based in part on maintaining the scenic qualities of the latter for tourism). Although there is a desire to minimize visual impacts, people also want to avoid disruption of wilderness areas and so may be willing to "put up with" lines in the populated corridor. Most people recognize that replacement of 2L1 with a new line, relocated in some sections, would allow reduction of present adverse visual impacts at Whistler and Pemberton. Concerns were expressed on additional clearing necessary on 2L1 ROW to accommodate a 500 kV line.

Vegetation Management

In the study area there is widespread opposition to the use of chemical herbicides (and especially aerial spraying of herbicides, though this is no longer a B.C. Hydro practice) to control vegetation on the ROWs. The main concern is the possibility of adverse effects on human health from herbicides in domestic water supplies (wells, surface water). Biological vegetation control is viewed as the optimum method, including commercial activity such as cultivation of Christmas trees and edible berries in the ROWs. Several people feel that mechanical and manual means of control could also create job opportunities in areas where unemployment is high.

Property Issues

Individual property owners near the routes studied have concerns about potential disturbances to their land or activities and potential land loss, if the project is built. Most area residents also believe that their property values would be detrimentally affected by the proximity of a new line. Landowners in the Antoine Creek Valley, where there are no lines at present, are adamantly opposed to the construction of any transmission lines near their property.

Possibility of Economic Benefits

Study area residents, especially those in communities losing population because of lack of jobs, are hopeful that the project would provide jobs for local people in clearing, construction or substation maintenance. The number of such jobs is actually very limited. Another economic opportunity that is frequently mentioned is that removal and sale of timber from the ROW could accrue to local businesses. There is also a great deal

of interest in associated project benefits such as the possibility of B.C. Hydro contributing to local efforts to upgrade and maintain the Hilene Road along Anderson Lake, although the Seton Lake Indian Band does not want the road upgraded until their development plans for their land are complete.

PCB Storage

There is some concern, especially in Birken and Pemberton, the communities closest to the Creekside Capacitor Station where PCBs are stored, that B.C. Hydro has not adequately addressed the issue of PCB storage in the study area.

It is noted that B.C. Hydro has given local residents a tour of the PCB storage site at Creekside when the methods of PCB storage and safety precautions were explained. Present physical conditions of storage at this site meet provincial standards. It is considered that this is not a project related concern.

Benefits for Impacted Communities

A broadly based belief throughout the study area is that small rural communities bear much of the cost and reap few of the benefits of developments such as the proposed transmission line. People in the study area have several ideas for appropriate methods of compensating affected communities such as: the initiation of an economic development fund contributed to by B.C. Hydro and other major corporations; the taxation of transmission lines; the development of recreational sites on B.C. Hydro land; and, assistance with local employment such as Christmas tree farming in the ROW.

B.C. Hydro's Relationship with the Public

B.C. Hydro is faced with continuing mistrust and cynicism from area residents, due in part to the series of events associated with the second stage of work on the Kelly Lake-Cheekye Project in 1982. People felt that the public consultation process undertaken at that time was "too little, too late" and that B.C. Hydro did not adequately respond to public concerns. Local residents seem to feel that the current consultation process is keeping them informed but many wonder whether their input will have any effect on project decision-making.

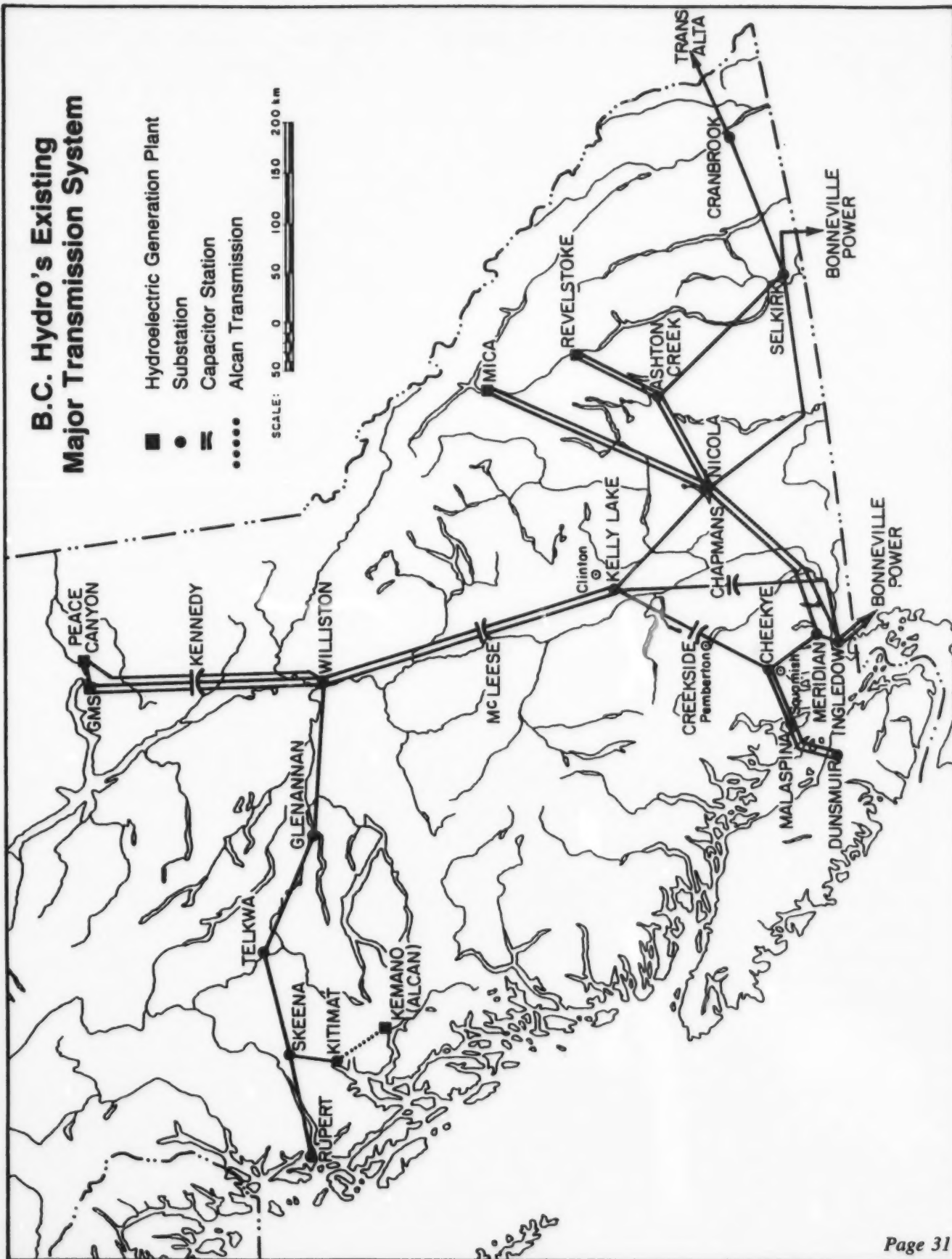
Meager Creek and other Independent Power Producer Sites (IPPs)

There is a concern in the Squamish area over the number of small hydro projects proposed by private developers; the guidelines for assessment and development of small

B.C. Hydro's Existing Major Transmission System

- Hydroelectric Generation Plant
- Substation
- = Capacitor Station
- Alcan Transmission

SCALE: 50 0 50 100 150 200 km



power projects are not well understood by the public. Queries were raised by elected officials in Pemberton and Squamish regarding the future development of thermal power at Meager Creek and the location of transmission lines to connect any generation there to B.C. Hydro's system.

Route-Related Issues

Support for Use of Existing 2L1 ROW

Most residents of the project area contacted to-date have expressed a preference for using the existing 2L1 ROW, if the project is built, to minimize environmental, aesthetic and economic costs. (This position is tempered by the concurrent view that a line should not be placed too close to population centers). This public perspective is also influenced by the possibility of improvements in alignment, as compared to the present 2L1.

Pavilion Route favoured over Antoine Route

Non-native residents in the study area are cognizant of the potential difficulties of routing a new transmission line through the existing corridor over the Pavilion and Bridge River Indian Reserves. However, many of the public in the Lillooet area feel that the Antoine Creek area should be maintained in its present natural state, in part to protect the wildlife populations there. In addition there is a community of about 50 residents living in Antoine Creek and Yalakom River Valleys who are vehemently opposed to any development in their area. They have established their community in a remote area precisely to avoid disruption and have stated their intent to oppose the project being built through the Antoine segment.

Anderson Route favoured over Duffey Route

There is strong support for the Anderson Lake route to avoid intrusion into a scenic area along the Duffey Route, which is being promoted as a tourist route now that the road is being paved. Although some residents along the Anderson-Gates segments may not want to have the line in their valley upgraded to higher capacity, some also feel that the remaining natural areas should be protected.

Whistler

No definitive balance of opinion has yet emerged from Whistler as to whether a route through Whistler is better than a bypass route, or not.

Release of 2L1 land

Many local residents that attended the Open Houses were pleased to learn that the easements forming the 2L1 ROW may be released by B.C. Hydro where the ROW is not required for the new transmission line or other future transmission lines.

SECTION 5.0 COMPARISON OF ROUTE OPTIONS

5.1 General

The opinions expressed in the following comparisons are those of B.C. Hydro's environmental consultants, B.C. Hydro's technical staff, and the public through the ongoing public consultation program.

Route location to-date has occurred with the intent of finding the route of lowest environmental and social impact without consideration of land ownership. Several Indian Reserves are crossed by segments of the route network shown in Figure A. To-date it has not been possible to discuss this project with all the Bands involved and it has not yet been agreed by any Band that they would negotiate a new ROW for this project.

As B.C. Hydro has no power of expropriation on Indian Reserve land it must be recognized that no final route can be determined, if it is proposed to cross an Indian Reserve, until the Band has agreed to provide a ROW.

B.C. Hydro's consultants have not yet been given access to the Indian Reserves in the study area to review site specific impacts and the present conclusions are based on what can be established from aerial photographs, and inspection from the air or highway. Discussion with managers of the reserves and site inspections may bring some changes.

In reviewing route options B.C. Hydro recognized public concerns related to electric and magnetic fields (EMF). B.C. Hydro has used as a siting guideline the results of reviews and studies on these fields undertaken by agencies such as the World Health Organization, the New York State Power Lines Project, Health and Welfare Canada and the Office of Technology Assessment Background Paper for the Congress of the United States. The consensus of these studies, after evaluating all of the available data, is that no risk to human health resulting from exposure to electric or magnetic fields at the strengths encountered under or near power transmission lines has been established. This conclusion was reinforced by the July 1989 decision by the British Columbia Utilities Commission that a 230 kV transmission line in the Courtenay area need not be re-routed because of the EMF. B.C. Hydro does however recognize the ongoing public concern regarding the EMF Issue and where practical has taken steps that will lower field exposures at nearby homes due to construction of the new transmission line.

Over 30 different routes from Kelly Lake to Cheekye can be traced through the network shown in Figure A. By a process of successive comparison of alternate routes through sub sections of the network and elimination of unattractive options, it is possible to reduce the network, leaving a much reduced number for final review, or possibly a single route.

The decisions which have to be made to reduce the network are:

- Selection between Antoine and Pavilion/Mission segments.
- Selection between the existing corridor (Mission, Anderson, Gates segments) and the Duffey segment.
- Selection between the existing corridor and western alternatives (Birkenhead/Owl and Birkenhead/Ryan/Rainbow segments).
- Selection between Whistler and Soo/Rainbow segments.
- Selection of a preference in Lower Cheakamus segment.

A discussion of each of these selections is made in the following sections and summarized in Tables 1 to 10. In reaching the conclusions the following general criteria were used:

- Preference is given to route requiring least permanent change in local environment.
- Preference is given to route with least potential for future impact on environment, example through slope failure or continued erosion.
- Reduction of impact on human settlement is encouraged.
- Preservation of natural areas with high scenic values or importance for wildlife is encouraged.

The opinion of the consultants undertaking the environmental studies can be summarized in five major conclusions:

- Use of the Pavilion/Mission segments would have less environmental impact than use of the Antoine segment.

- Use of the Mission/Anderson/Gates segments would have much less environmental impact than use of the Duffey segment.
- Use of the Birkenhead/Owl segments, or the Birkenhead/Ryan/Rainbow segments, would have greater environmental impacts than use of the corresponding segments in the existing corridor.
- Use of the Whistler segment would have less environmental impact than use of the Soo/Rainbow segments, and would have much less impact if mitigation work is done, such as rerouting of 2L2 south of Whistler. However use of the Soo/Rainbow segments would not have unacceptably high impacts and could be justified if a very high importance was placed on reduction of visual impacts in Whistler, and less importance on locating a line through an area of high future interest for recreation from Whistler, such as for heliskiing or motorized summer and winter recreation.
- Use of the 2L1 ROW by the new transmission line is desirable unless a diversion has significant benefits.

5.2 Antoine versus Pavilion/Mission

The major reason in favour of the Pavilion/Mission route (the existing corridor) is that all impacts are incremental to the present situation and are considered less disruptive than the development of a new route where, for example, new access roads would have to be developed. Detailed specific and significant arguments are:

Terrain

The Antoine segment crosses very difficult unstable terrain on the steep east side of the Fraser Canyon. Construction of an access road and tower foundations would create much visual scarring, with continued ravelling and erosion of cutbanks. Because of the extremely dry climate revegetation is very difficult.

The terrain in the drainage of Antoine Creek is also difficult in that it is very steep, with limited vegetation, and prone to instability. Construction of an access road and tower foundations would lead to much terrain disturbance and the dry climate would make revegetation very difficult.

By contrast, in the existing corridor, the necessary access roads have already been constructed in the sections with difficult terrain, such as the east side of the Fraser

Canyon and the east side of the Camelsfoot Ranges. Any impacts from new construction would be minor.

Wildlife

Construction and operation of the line along the existing corridor would produce an incremental impact on wildlife habitat and disturbance. Use of the Antoine segment would bring disturbance and new access to a new area of the bighorn sheep winter range in the Fraser Canyon, which has recently been enhanced, and to the Antoine Creek Valley which, because of access restrictions, is presently still in its natural condition, and an area known to be important for wildlife.

Visual

Construction along the existing corridor would create an incremental impact in visually sensitive areas such as the views from rafts on the Fraser River, on the Diamond S ranch, and the views westward from Highway 12, but not from any areas of settlement.

Use of the Antoine segment would create new high impacts in visually sensitive areas such as the Fraser Canyon and at Camelsfoot Bend on the Bridge River. It would also have a very severe visual impact on the small community in the Antoine Creek Valley who settled there in recognition of its fine natural setting.

Heritage

The Antoine segment traverses an old Indian village site in Kelly Creek Valley and skirts another at Kelly Creek IR 3 in the Fraser Canyon, it is recognized that these could be protected by careful tower location but the increased access and activity will bring disturbance. Impacts along the existing route have already largely occurred, but two important sites exist near Cutoff Creek, and an area of high potential at the Bridge River crossing.

Social

The existing corridor skirts all areas of settlement. At the Pavilion Indian Reserve the line is out of sight of the village. The Antoine option cannot avoid running very close to the small settlements in the Antoine Creek Valley and at its junction with the Bridge River.

The Antoine route creates a new hazard for aircraft in the Fraser Canyon, if the existing corridor is used no new hazard is created.

If the existing corridor is favoured it is necessary to determine a preference for the sub-

options at Pavilion. Option CE, the existing corridor, is highly preferred over CDE for the following reasons:

Visual

CDE requires two crossings of Highway 12, and a traverse of the benchlands on the east side of the Fraser Canyon in the foreground of the view across to the Camelsfoot Range from the highway, without the benefit of any screening by trees.

Agriculture

CDE requires a crossing of the irrigated hayfields on the east side of the Fraser Canyon, towers would disrupt the wheeled irrigation system.

Hazard

Use of CDE separates the crossings of the Fraser Canyon by 1 kilometre increasing the hazard to light aircraft.

5.3 Duffey Segment versus Mission/Anderson/Gates Segments.

Again the major environmental reason in favour of use of the existing corridor is that the impacts of construction are incremental, and the impacts of operation are virtually zero as the new line would replace an existing line, or be adjacent to an existing line. By contrast use of the Duffey segment requires construction and operation in a valley presently unencumbered by transmission lines.

The major specific reasons are:

Terrain

The terrain of the Cayoosh Canyon is very unfavourable for construction of a transmission line. It would involve construction of foundations in highly weathered rock on very exposed steep ridges. In the Duffey Lake section there is a considerable avalanche hazard. By contrast, except for some short sections in the Gates River Valley and Whitecap Creek, the existing corridor offers relatively easy terrain conditions for construction of transmission lines, with limited exposure to hazards.

Forestry

The valleys of Joffre and Cayoosh Creeks present a better opportunity for commercial forestry than those of the drier existing corridor.

Wildlife

Use of the existing corridor will create only minor habitat changes and few significant impacts for wildlife. Use of the Duffey segment will bring new disturbance to the Cayoosh Ranges, a high quality habitat for mountain goat.

Visual

The provincial government will complete upgrading of the Duffey Lake road in 1990, turning it into a highly popular tourist route. The adverse visual impacts of construction in the confined landscape of the Duffey segment, particularly in the Cayoosh Canyon, will be much greater than the incremental impacts of construction, largely on an existing ROW, in the existing corridor, especially when mitigated by proposed relocation in Gates River Valley, and at D'Arcy.

The Village of Lillooet is opposed to use of the Duffey segment because a 500 kV transmission line skirting the western edge of the village would be highly visible.

The Village of Lillooet and Squamish Lillooet Regional District both advised they desire to see continued use of the existing corridor so as to prevent intrusion of transmission lines into new areas, and to maintain a high quality visual experience along the upgraded Duffey Lake road which they anticipate becoming a major tourist route.

Land Use

Use of the Duffey Lake segment would require a new ROW through Mount Currie Indian Reserves 6 and 7, and adjacent to the new village. The Mount Currie Band has stated its opposition to this because of the proximity to the village, and the use of developable land for a ROW.

With the alignment proposed in the Gates River Valley and removal of 2L1 many of the existing constraints on land use on the narrow valley floor are removed. Further reductions in constraints on land use could be achieved in Birkenhead River Valley. B.C. Hydro proposes to review this section.

5.4 Birkenhead/Owl Segments versus Gates/Pemberton Segments

The environmental impacts of transmission line construction and operation vary directly with the difficulty of the terrain and with the length of the line. The Birkenhead/Owl option is 6 kilometres longer than the Gates/Pemberton option (the existing corridor) and requires construction over a major mountain ridge system, as compared to construction

in a valley. Further improvements in alignment are possible in the Gates and Pemberton segments.

The most important factors in favour of the existing corridor are:

Terrain

Construction in the sub alpine and alpine zones over the ridges of the Owl and Fowl drainages would create considerable adverse impacts relative to construction in the valleys below.

Water

Use of the Birkenhead/Owl option requires a quality crossing of the watershed for the Village of Pemberton. Clearing and maintenance of the ROW might cause siltation.

Agriculture

The Birkenhead/Owl option would create a new ROW across the farmlands of the Lillooet River Valley, interfering with machinery operations. Use of a ROW adjacent to an existing ROW should cause fewer problems.

Recreation

The Ministry of Parks is adamantly opposed to a route through Birkenhead Lake Park. It is recognized that there would be severe visual impacts as the route would lie along the southeast side of the lake, crossing the slope through a closed canopy forest at some height above the lake to avoid the alluvial fans located at the bottom of the gullies.

A provincial park is planned for the highly scenic alpine area of the Owl and Fowl Creek drainages. Construction and operation of the transmission line would detract significantly from the enjoyment of this area.

Visual

The Birkenhead/Owl option will be highly visible in its crossing of the Birkenhead Valley, the descent into the Lillooet River Valley, its skirting of the west and south sides of Pemberton, and at its crossing of Nairn Falls Provincial Park. However its use would permit removal of one transmission line in the existing corridor between D'Arcy and Pemberton.

The level of visual impacts in the existing corridor would be incremental, and should be reduced by diversion from the 2LI ROW in the Gates River Valley and

through Pemberton, although the diversion at Pemberton would have adverse visual impact where a new ROW would be cleared over Signal Hill.

5.5 Birkenhead/Ryan/Rainbow Segments versus Gates/Pemberton/Green/Whistler Segments

Use of the Birkenhead/Ryan/Rainbow option results in a construction length of 100 kilometres, as compared to 78 kilometres in the existing corridor, through much more difficult terrain, in general environmental impacts are directly proportional to length. Major mountain ridges are crossed at the head of Tenas and Ryan Creeks, between Rutherford Creek and Soo River, and through the pass west of Rainbow Mountain.

The impacts of construction and operation of the line in the Birkenhead/Ryan/Rainbow segments would be much higher than for construction and operation in the existing corridor. Significant differences in impact are:

Terrain

The headwater areas of Tenas and Ryan Creeks represent very difficult terrain for construction and operation of transmission lines, due to steep slopes, and frequency of rock slides and avalanche areas. In particular the section in Ryan Creek poses considerable hazard to a transmission line, although technical staff consider a route is possible.

The use of a route over mountain ridges in the Coastal Mountains at the elevations shown below presents considerable problems for maintenance, or emergency repairs, under winter conditions.

Between Tenas Creek and Lillooet River	1980 metres (6500 feet)
Between Ryan and Rutherford Creeks	1675 metres (5500 feet)
Between Rutherford Creek and Soo River	1645 metres (5400 feet)
Pass west of Rainbow Mountain	1310 metres (4300 feet)

Forestry

Use of the existing corridor requires use of much less productive forest land than the Ryan Option.

Wildlife

Use of the Ryan option will result in a major disturbance of an existing wilderness area centered on Ryan Creek Valley that is important to mountain goats and grizzly bear. This area is the closest viewing site for the latter to Vancouver.

Recreation

The Ryan option has the same adverse impacts in Birkenhead Lake Provincial Park as discussed in Section 5.4. It also crosses the same proposed provincial park located in the alpine areas of Owl Creek drainage and Tenquille Lake, creating the same adverse impacts.

In using the pass west of Rainbow Mountain, and the Callaghan River Valley, it traverses an area of considerable future interest to the Resort Municipality of Whistler. The Municipality and the provincial and regional governments have yet to agree on plans for the area. It is known that both the Ministry of Parks and Ministry of Forests have recreation or park plans for the Callaghan Lake and Powder Mountain areas.

Visual

The Ryan option would have high visual impacts in Birkenhead Lake Provincial Park, at the settlement at the south end of Birkenhead Lake, and at the crossing of the Lillooet River Valley, where the ROW would be highly visible on the slopes on each side of the valley. However, use of this option would allow the removal of one transmission line between D'Arcy and Daisy Lake, which would reduce present levels of visual impact in the existing corridor.

Social

Many people expressed a desire to limit transmission lines to existing corridors, particularly when the line is a replacement, rather than impact new areas. The Ryan option represents the greatest intrusion into wilderness areas of any of the options reviewed.

5.6 Soo/Rainbow Segments versus Whistler Segment

Comparison of these options involves a decision between a new route penetrating an area of no settlement, but one of heavy forestry use with recreation interest, and the incremental impact of use of an existing corridor.

The conclusion of the consultants was that each option could be constructed and operated within an acceptable level of environmental impact, but that use of the existing corridor, mitigated by use of the proposed new alignment from Alta Lake to Daisy Lake, would result in lower impacts to biophysical resources.

Significant issues in this choice are:

Terrain

The pass west of Rainbow Mountain is a difficult area for transmission lines as it is subject to avalanches from the east and a rock slide on the west. Field studies indicate that a secure route can be found for one 500 kV transmission line.

Wildlife

Construction and operation of the line would disturb wildlife in the Soo River wetlands. Construction in the existing corridor would result in temporary impacts in the wetlands between Green and Alta Lakes as 2L1 was removed and the new line constructed.

Forestry

The Soo/Rainbow option requires the use of 41 kilometres of ROW in productive forest land as compared to about 23 kilometres in the existing corridor, excluding that portion of the segment through settled areas.

Recreation

The Rainbow Mountain, Callaghan Lake, Callaghan and Powder Mountain arc is seen as important for summer and winter recreation based in Whistler. Concern has been expressed by many about crossing this area with a transmission line before plans for its future have been established. The Soo and Callaghan Valleys are seen as offering excellent potential for recreation in winter and summer and becoming important as access corridors to other recreation areas. The Ministry of Crown Lands is concerned about the visual impacts, and safety, in relation to heli-ski operations in this area.

Visual

Use of the Soo/Rainbow option would remove one transmission line from the Resort Municipality of Whistler. However from the north end of Green Lake to the north end of Alta Lake the line to be removed would be the centre line in an arrangement of three parallel lines, resulting in only a limited benefit.

Coming south, the line to be removed is on the bench west of Alta Lake, the two lines near Alta Lake would remain. South of Tamarisk to Daisy Lake one of the two lines close to the highway (2L1) would be removed. This last benefit would also be achieved by use of the revised alignment proposed for the existing corridor between Alta Lake and Daisy Lake. In total there would be very little visual benefit in Whistler from using the Soo/Rainbow option.

Visual impact in the Soo/Rainbow route would be high as the line lies totally within a scenic natural area.

Social

The decision to be made between these routes is one of differing social values, reduction of visual impacts in a developing community compared to acceptance of greater environmental impacts and adverse impacts on possible future development of the recreation land base for Whistler.

5.7 Lower Cheakamus Sub-Options

It was proposed in earlier studies to use the existing 2L1 ROW through this area, but as the study progressed issues emerged requiring a review of some alternates. Local residents opposed to the replacement of 2L1 requested a review of routes other than the existing ROW. It became apparent that the 2L1 ROW was so close to the North Vancouver Outdoor School that location of a 500 kV line with additional clearing would be very difficult. An unresolved dispute exists over the existing ROW on the Cheakamus Indian Reserve. It was therefore decided to study the sub-options shown in Figure A.

These are now reviewed in the following sequence:

PR (west sub-option) versus PQR (existing ROW).
RST (south sub-option) versus RT (existing ROW).
QS (east sub-option) versus QRS (existing ROW).

PR versus PQR

Terrain

Use of PR would require construction on steep sidehill while PQR is on the valley floor with a developed access road. Use of PR would have much higher adverse impacts, such as erosion.

Visual

The PR route would be visible for most of its length from Highway 99 as a cut across a forested slope in the middle ground of a dramatic view of the Tantalus Range. The PQR route is not visible from the highway. In addition the PR route may be visible to all residents in the lower Cheakamus Valley because of its location high on the steep hillside while a transmission line on the existing ROW is screened by trees from many residents.

Fish

The Cheakamus River is a highly prized sport fishery. Use of the PR route which parallels it, might result in siltation of the river until a vegetative cover was restored. Because PQR is a mature ROW no siltation from it is anticipated.

Forestry

Use of PR would remove land from the commercial forest land base, as PQR lies mainly on private leases it is doubtful if any trees grown on it after removal of 2L1 would contribute to the commercial forest land base.

Social

During the project Open House held in Squamish and in subsequent correspondence, a number of residents of the Cheekye/Paradise/Cheakamus Valley area stated their opposition to a second line through the Valley and to replacement of the existing 230 kV circuit 2L1 with a new 500 kV line on the same ROW. Concerns with environmental impacts, electric and magnetic fields and use of herbicides are noted as the rationale for this position. They requested that an alternate route - removed from populated areas - be found. The use of PR would be one such alternate route.

With respect to electric and magnetic field (EMF) effects on health of the World Health Organization, the New York Power Lines Project, Health and Welfare Canada and the Office of Technology Assessment Background Paper to the Congress of the United States, after evaluating all of the available data, is that no risk to human health resulting from exposure to the EMF from power transmission lines has been established. Within British Columbia this conclusion is supported by the B.C. Utilities Commission Inquiry in July 1989 regarding the possible relocation of a line due to EMF. That inquiry concluded, in part, "There is, however, insufficient evidence to support a presumption of an actual health risk. This conclusion holds for ... residences close to high voltage transmission lines." B.C. Hydro does however, recognize that there are ongoing concerns regarding EMF exposures and where practical has taken steps that will lower field exposures at nearby homes due to construction of the new transmission line.

Conclusion

From an environmental perspective, the use of the existing ROW (PQR) is better than PR. This is supported on technical grounds as no new access is required, and there are fewer angles. However, local residents have expressed opposition to the use of the existing ROW (PQR).

RST versus RT

Terrain

RT is located on the flood plain of the Cheakamus River and the alluvial fan of Cheekye River. No adverse impacts are anticipated from use of the existing ROW.

RST rises from the flood plain onto the rock bluffs east of the Cheakamus River, traverses the edge of the bluffs and then descends to Cheekye across the alluvial fan of Cheekye River.

It is considered that use of RST would have more impact on terrain but the extent would be determined by the amount of new access road required. If helicopter construction was used along the bluffs terrain impacts would be low.

RST is less exposed to hazard as it is less threatened by erosion from the Cheakamus River or debris flows in Cheekye River, which are relatively frequent.

Visual

The RT route is adjacent to the Cheakamus valley access road from the North Vancouver Outdoor School north for 2 kilometres. The extra clearing required for a 500 kV line would probably remove much of the limited screen of trees between the road and the school. If the new line were switched to the west side of the road to protect the screen of trees then it would require clearing of old cedar trees which are highly regarded for education with information trails established through the grove.

The RST route becomes exposed to southbound travellers in the Cheakamus Valley where it ascends the steep rock bluff at S. The visual impact of this is reduced in that no clearing is required. The route is not visible from Highway 99 or Brohm Lake.

Fish

Use of RST avoids two crossings of Cheakamus River.

Recreation

Brohm Lake is an important Ministry of Forests recreation site, the RST route would only be visible to those that walk westwards to seek a view into the Cheakamus Valley.

Forestry

RT is almost all over private land (North Vancouver Outdoor School 2.5 kilometres, Cheakamus Indian Reserve 0.5 kilometres, others 2 kilometres) of high forest capability.

RST is located on rock bluffs for 4 kilometres with only 2 kilometres on high capability land.

Social

The North Vancouver Outdoor School has expressed its concerns on use of the 2L1 ROW since 1983. It is recognized that a 500 kV line could not be located on the existing ROW without the additional clearing bringing major changes to the local environment of the school.

The School staff have requested that, if RST is used, the caves at the base of the bluff near S no. be disturbed by construction of the line.

The Squamish Indian Band stated in 1983 that there was a dispute over B.C. Hydro's entitlement to use the 2L1 ROW over the Cheakamus reserve. Their preference at that time was that the existing line be removed and not replaced. Their present position is not known.

Heritage

A mythological site of the Squamish Indians has been identified at the bluffs north of S. The site is a natural stone face overlooking the river and marks the site of an event in one of the myths of the Squamish Indians. The site is known as 'Wountie' and is judged to have considerable heritage significance.

Conclusion

RST is favoured as it avoids the Outdoor School, where impacts would be high, and the Cheakamus Reserve, which is the preference stated by the Squamish Indian Band in 1983 and because there is very little other difference in environmental impacts, provided that an alignment is found which does not impair the mythological site.

QS versus QRS

Terrain

QS runs for 8 kilometres on a series of rock benches above the east side of the Cheakamus. The degree of terrain disturbance would depend on whether

construction of access roads is required or whether helicopters would be used. QRS runs on the flat valley floor, with access already provided, except for the short ascent to S.

Visual

The south 4 kilometres of QS would be highly visible from Highway 99 with towers and conductors located in the foreground of the dramatic view west to the Tantalus Range. The whole length would be very visible from the floor of the Cheakamus Valley.

By contrast QRS is not visible from the highway and when on the valley floor is so screened by trees that only short sections would be visible from homes in the Cheakamus Valley.

Forestry

In QRS 5 kilometres is on alienated land and 3 kilometres on Crown land. All of QS is on Crown land, so use of QS will result in a reduction in the commercial forest land base, even though QRS represents better quality sites.

Heritage

Use of QS would avoid the mythological site identified at the bluffs below S.

Social

Please refer to the comments in the previous comparison of PR versus PQR with respect to the concerns of local residents about the use of the existing ROW and their request that an alternate route be found. QS is another such alternate route.

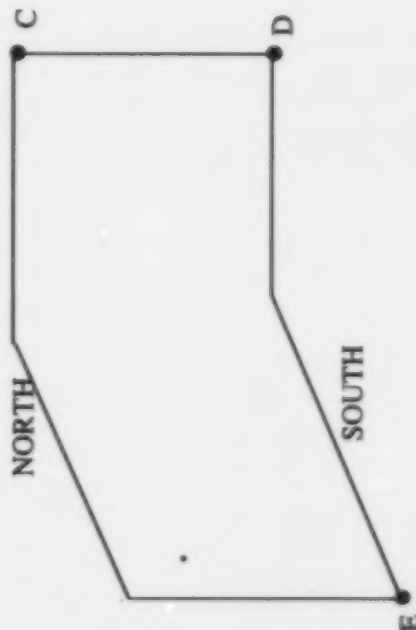
Conclusion

From an environmental perspective the use of QRS has much lower visual impact than QS and is better on that ground, provided a route can be found that does not impair the mythological site. However, local residents have expressed opposition to the use of the existing ROW.

The generally favored route is the south sub-option, namely RST, which avoids the Outdoor School and the Cheakamus Indian Reserve. However further analysis and discussion is required before a conclusion can be reached among the three alternatives (the west and east sub-options and the existing route), for that area north of the Outdoor School. The environmental consultants are of the opinion that the use of the existing ROW is better than the east and west sub-options described above, whereas residents are opposed to the use of the existing ROW.

TABLE 1
SUMMARY COMPARISON OF ROUTE OPTION

1. Fraser Crossing	Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
	CE 6.9	CE 3.6	CDE has high visual impact with crossing of 5L41, 2 highway crossings and new river crossing, and makes new intrusion into bighorn sheep range. CDE requires crossing of irrigated fields. CE is adjacent to existing TL, minimal new access is required.	CE has access already developed. CE avoids creating a new hazard for aircraft. The necessary crossing of 5L41 is more difficult on CDE.
	CDE 6.2	CDE 3.2		



Note 1.

The costs shown for each route option are preliminary estimates providing only order-of-magnitude costs. They include direct costs (e.g. costs of engineering, survey, clearing, and construction) plus an allowance for inflation and for indirect costs (e.g. corporate overheads and interest during construction) determined as 50% of the direct costs. Not included are costs associated with transmission line losses, transmission line maintenance, and the removal of existing circuit 2L1.

TABLE 2
SUMMARY COMPARISON OF ROUTE OPTION

Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
2. Antoine versus Pavilion/Mission			
BG 44 BCEFG 44	BG 35.7 BCEFG 25.2	BCEFG involves construction on an existing ROW from B to C and along an existing corridor from C to G. BG is a new route. Along BG there are severe problems with difficult terrain along Cavanagh and Antoine Creeks. BG crosses high value wild-life habitat in Fraser Canyon, Antoine Creek and Bridge River valleys. Visual impact of BG is higher at Fraser and Bridge River crossings because new, more attractive sites are affected. Two large important heritage sites lie along BG. BG has severe impact on small community in Antoine Creek valley, while BCEFG avoids Pavilion village and other settlements but crosses Pavilion and Bridge River Reserves. Wilderness value of Antoine Creek Valley is lost.	The terrain conditions along BG give problems for access roads, foundations, and site restoration. Terrain along BCEFG is steep, and access, although difficult, is established.

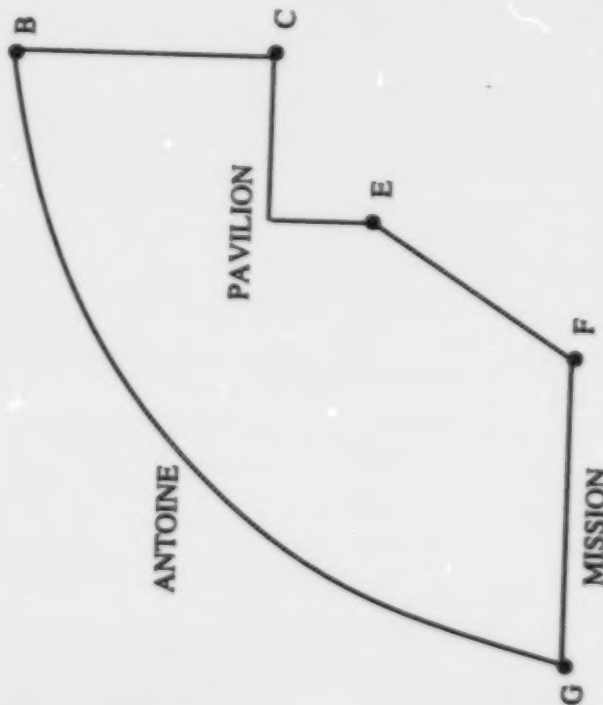
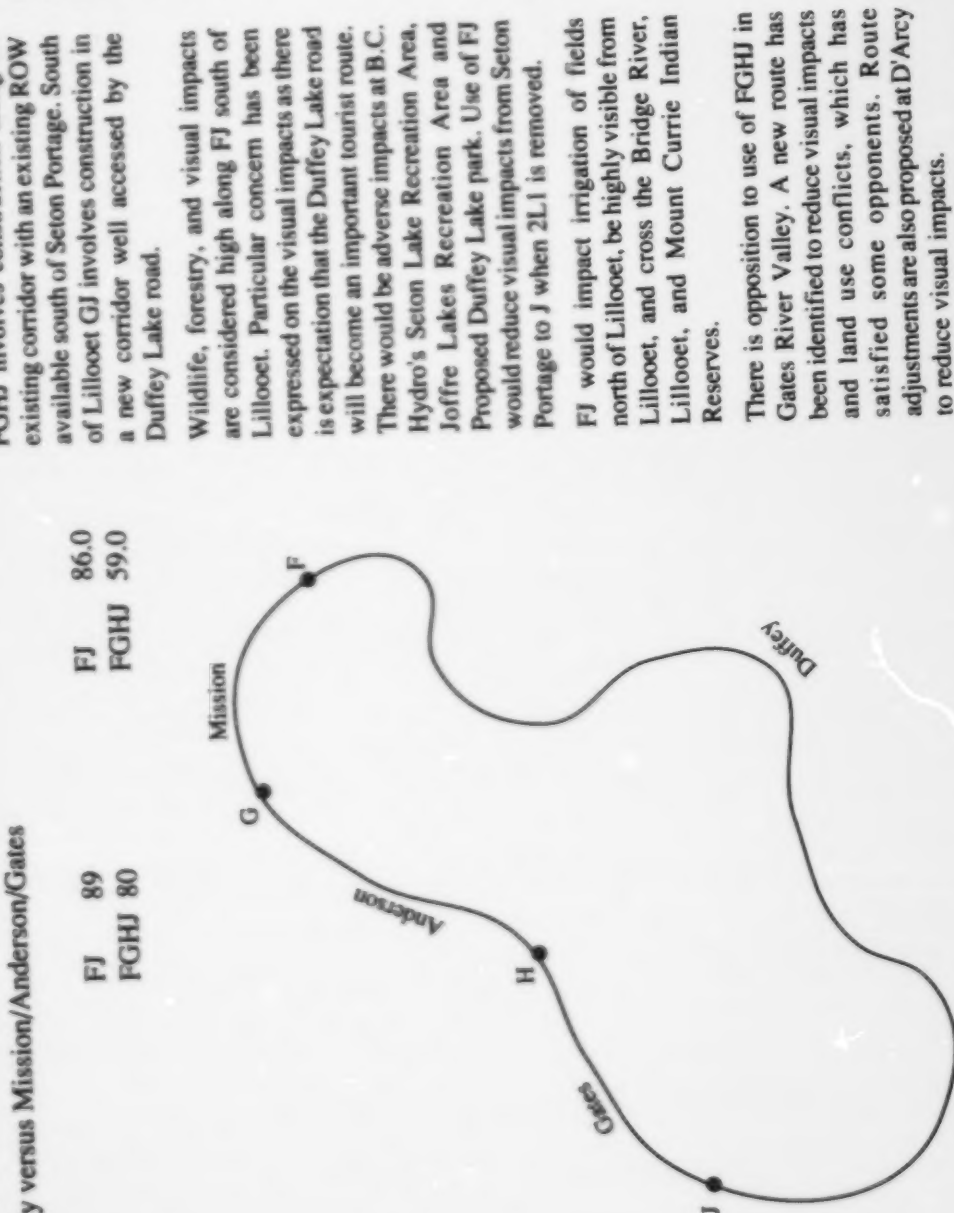


TABLE 3
SUMMARY COMPARISON OF ROUTE OPTION

Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
3. Duffey versus Mission/Anderson/Gates			
FJ 89	FJ 86.0	FGHJ involves construction along an existing corridor with an existing ROW available south of Seton Portage. South of Lillooet GJ involves construction in a new corridor well accessed by the Duffey Lake road.	Along FJ there are very difficult terrain conditions for 10 kilometres in Cayoosh canyon with its steep walls. There are only very limited terrain problems in FGHJ
FGHJ 80	FGHJ 59.0	Wildlife, forestry, and visual impacts are considered high along FJ south of Lillooet. Particular concern has been expressed on the visual impacts as there is expectation that the Duffey Lake road will become an important tourist route. There would be adverse impacts at B.C. Hydro's Seton Lake Recreation Area, Joffre Lakes Recreation Area and Proposed Duffey Lake park. Use of FJ would reduce visual impacts from Seton Portage to J when 2L1 is removed.	B.C. Hydro has lost towers due to debris in snow slides on the big burn southwest of Seton Portage. The trees on this are gradually growing and should soon arrest the slides. There is greater avalanche potential on FJ. FGHJ has established access roads; FJ would require extensive development of access roads.
		FJ would impact irrigation of fields north of Lillooet, be highly visible from Lillooet, and cross the Bridge River, Lillooet, and Mount Currie Indian Reserves.	5L42 was constructed to very conservative standards over Mission Ridge because of predicted severe icing. This has not occurred so for 5L46 more conventional standards are proposed.



There is opposition to use of FGHJ in Gates River Valley. A new route has been identified to reduce visual impacts and land use conflicts, which has satisfied some opponents. Route adjustments are also proposed at D'Arcy to reduce visual impacts.

FGHJ crosses Indian Reserves at Seton Portage, D'Arcy, and near J.

TABLE 4
SUMMARY COMPARISON OF ROUTE OPTION

Technical
Considerations

Environmental
Factors

Transmission Cost
(see Note 1, Table 1)
(M\$)

Length
(km)

4. Antoine/Anderson/Gates versus Pavilion/Duffey

The issues along BG and BF are discussed in Table 2, and in GHJ and FJ in Table 3.
BGHJ avoids the Pavilion and Bridge River Reserves, and reserves between G and J could be avoided if necessary. However it has severe impacts on the small settlement in Antoine Creek Valley.
BFJ requires new right of way on the Pavilion, Bridge River, Lillooet, and Mount Currie Reserves.

See left

BFJ 108 101.0
BGHJ 109 84.5

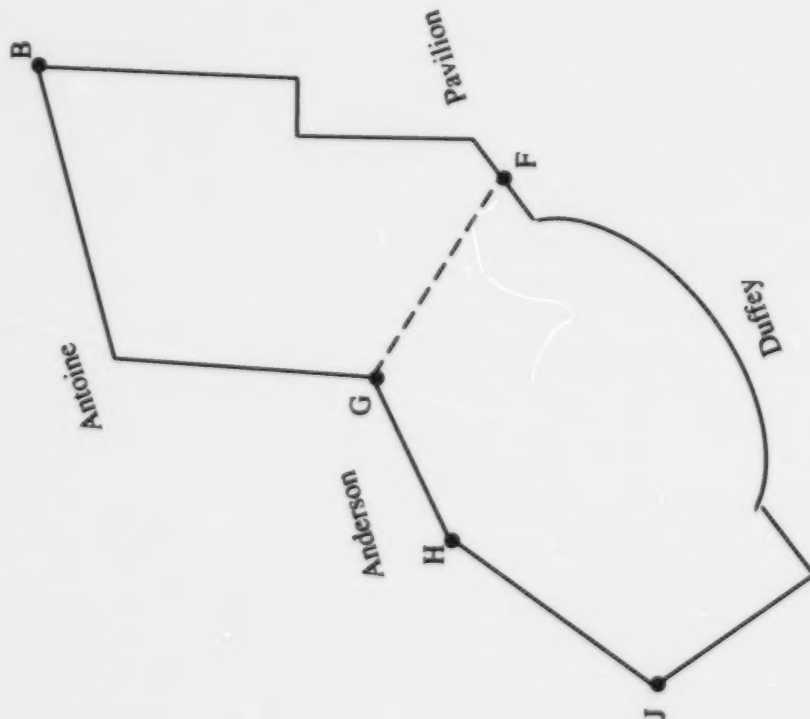


TABLE 5
SUMMARY COMPARISON OF ROUTE OPTION

Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
5. Birkenhead/Owl versus Gates/Pemberton			
HIK 45	HIK 42.8	HJK involves construction in an existing corridor. HIK is a new route.	HJK is a valley route with good access. HIK requires crossing of sub-alpine terrain at an elevation of 1300 metres.
HJK 38	HJK 26.0	HIK has severe visual impacts in Birkenhead Lake Park and Mount Ronayne Park proposal and at Pemberton. It reduces visual impacts in existing corridor when 2L1 removed.	Heavier, more expensive, structures would be required in high elevation section.
		HIK requires a new ROW across farm land in Pemberton Valley and clearing in watershed of Pemberton.	New access required in steep terrain in HIK with difficult construction conditions.
		There is opposition to use of HJ from residents of Gates River Valley. A new route has been identified on the south side of the valley to reduce visual impacts and land use conflicts, which has satisfied some opponents.	
		The cottage owners at Birkenhead Lake are very opposed to HIK.	
		Both options would result in 2L1 being removed from south approach to Pemberton and from within Pemberton.	

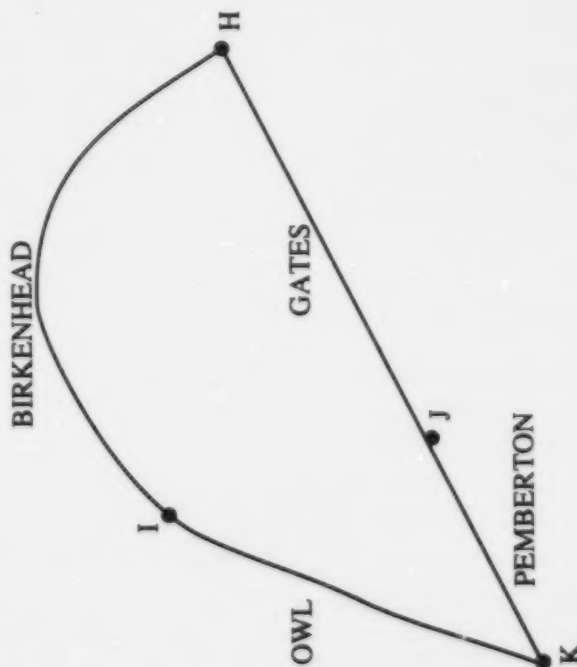


TABLE 6
SUMMARY COMPARISON OF ROUTE OPTION

Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
6. Birkenhead/Ryan/Rainbow versus Gates/ Pemberton/Green/Whistler	HIMN 100 HJKLN 77	HIMN is an entirely new route mainly through sub-alpine wilderness or rugged forested valleys. HJKLN involves construction in an existing corridor.	HJKLN is a valley route with good year round access. HIMN involves crossing four mountain ridges or passes to elevations of 1980, 1675, 1645 & 1310 metres in region of high snow-fall and conductor icing. Restrictions on maintenance and construction are severe.
	HIMN 99.9 HJKLN 53.6	HIMN has high impact on forestry and wildlife. Visual impacts are high at Birkenhead Lake Park, Mt. Ronayne Park Proposal, Pemberton Valley, and in Rainbow Pass. It reduces visual impacts in existing corridor from H to N when 2L1 removed.	Construction in upper Ryan River drainage would be very difficult. Mountain sections have high avalanche hazard, extensive lengths of helicopter access would be necessary.
		There is opposition to use of HJ in Gates River valley, but a route has been identified on south side of valley that satisfies many opponents. There is a desire in Pemberton to move transmission lines out of the village. Both options achieve this for 2L1.	
		The use of HIMN would remove the centre of three lines from Whistler, which is seen as a benefit by some, but the reduction in visual impact is low. West of Whistler use of a new route is proposed in existing corridor to reduce visual impact along Highway 99.	
		HIMN imposes land use restrictions on farm land in Pemberton Valley and reduces recreation potential of lands west of Whistler.	

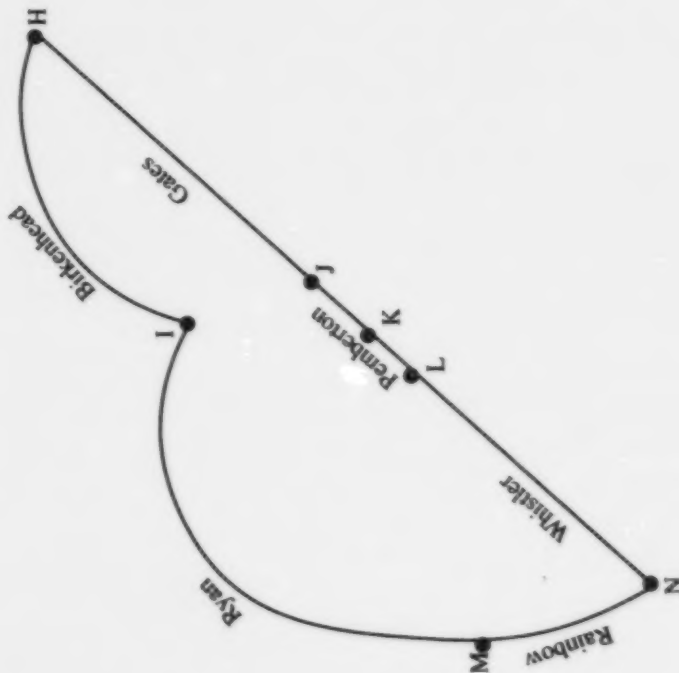


TABLE 7
SUMMARY COMPARISON OF ROUTE OPTION

Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
7. Soo/Rainbow versus Whistler			
LMN 41	LMN 34.1	LN involves construction in an existing corridor. LMN is a new route. LMN has high forestry impacts, and visual impact in Soo Valley and Rainbow pass, possibly affecting recreation potential of land of future importance to Whistler. It reduces visual impacts from L to N when 2L1 removed. The use of LMN would remove the centre of three lines from Whistler, which is seen as a benefit by some, but the reduction in visual impact is low. A new route is proposed in LN west of Whistler to reduce visual impacts along Highway 99 and in Brandywine Park.	In LN it is necessary to use some piled foundations across wetlands at Whistler. LN is all in valley with good access, LMN involves rising to an elevation of 1310 metres at Rainbow Pass in a high snowfall area with adjacent avalanche area on north side, and potential for conductor icing.
LN 37	LN 26.1		

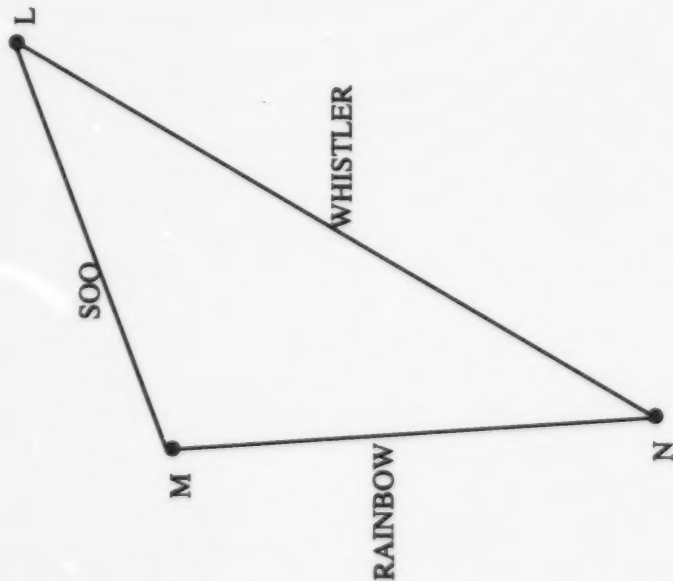


TABLE 8
SUMMARY COMPARISON OF ROUTE OPTION

Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
8. Cheakamus west versus Cheakamus valley			
PR 10	PR 8.6	PQR is an existing 2L1 ROW. PR is a new route.	PR has very poor access, QR has mature ROW on valley floor. New ROW is required for PQ.
PQR 9	PQR 4.8	PR is highly visible from highway and valley, it has high forestry impacts, and high potential to impact fish in Cheakamus River due to erosion from ROW on steep sidehill. Residents in valley would prefer route other than 2L1. However not many live close to ROW.	

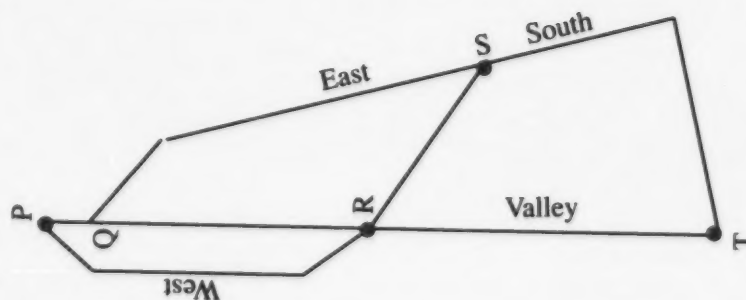


TABLE 9
SUMMARY COMPARISON OF ROUTE OPTION

Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
9. Cheakamus south versus Cheakamus valley			
RT 5	RT 2.3	RT is on existing 2L1 ROW. RST is a new route.	RT is existing mature ROW on flood plain with good road access. RST crosses river onto rock bluffs and proceeds south in rocky area with limited access.
RST 6	RST 4.8	RT is very close to buildings of North Vancouver Outdoor School, further clearing would detract from school. Existing ROW is contested in Cheakamus IR.	
		RST is screened from Cheakamus Valley, except for rise onto bluff near R, from Brohm Lake and Highway 99.	

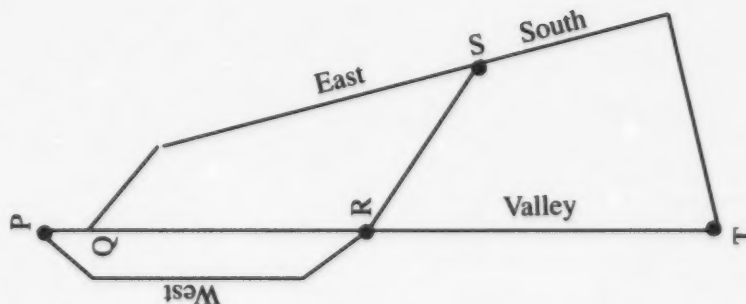
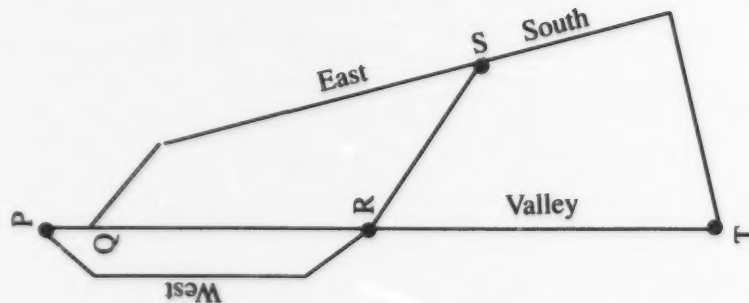


TABLE 10
SUMMARY COMPARISON OF ROUTE OPTIONS

Length (km)	Transmission Cost (see Note 1, Table 1) (M\$)	Environmental Factors	Technical Considerations
10. Cheakamus valley versus Cheakamus east			
QRS 9	QRS 4.5	QRS is on existing mature 2L1 ROW from Q to R and new ROW from R to S. QS is all new.	QS is on rock bluffs with no road access. Helicopter construction necessary to avoid high road costs and visual impacts.
QS 10	QS 7.8	QS is highly visible from highway and valley. QRS is only visible in RS section where it rises onto bluffs. Residents in valley would prefer route other than 2L1, but not many live close to 2L1.	QR uses existing ROW on valley floor. RS is only 2 kilometres, but rises steeply to bluffs.



SECTION 6.0 THE GENERALLY FAVORED ROUTE

The opinion of the majority of the public, as expressed to-date at many meetings and eight open houses is that it would be favorable to follow the existing transmission line corridor, where possible. B.C. Hydro's environmental and social consultants, namely that use of the existing corridor has real advantages over use of other route options. B.C. Hydro's technical and cost studies also reach the same conclusion. At this point therefore, apart from Whistler and the Lower Cheakamus area, there appears to be broad general agreement in favour of use of the existing corridor including route changes at D'Arcy, Gates River Valley, Pemberton, and in the Upper and Lower Cheakamus Valley off the 2L1 ROW. At Whistler no firm opinion has yet emerged on route selection.

The suggestion that the existing transmission line corridor is generally preferred is still tentative as the formal opinion of most of the Indian Bands has not yet been obtained. The validity of this will be tested by distribution of this report, discussion of the project with the Indian Bands, and further public consultation undertaken by B.C. Hydro. If agreement on a ROW cannot be reached with Indian Bands along the route, it will be necessary to develop route variations to avoid the reserves.

Following further public consultation and providing there are no major changes in public opinion, B.C. Hydro would apply to government for an Energy Project Certificate to construct the project in the existing corridor, using the revised alignment described at all open houses. The exceptions are the Whistler and the Lower Cheakamus areas. In Whistler both options will be carried forward pending further detailed consultation with provincial agencies, the Squamish Lillooet Regional District, the Resort Municipality of Whistler, and the public. In the Lower Cheakamus area further study and discussion is required to arrive at agreement on a route north of the Outdoor School. It is however proposed to by-pass the school.

Social and Environmental Issues of Generally Favored Route

The social issues which would have to be addressed in planning, construction, and operation of a transmission line along the existing corridor are as follows:

- a. Negotiation of an agreement for new ROW with Pavilion, Bridge River, Seton Lake, and Anderson Lake Indian Bands, and other property owners.
- b. Protection of water intakes and quality along Seton and Anderson Lakes and in Gates River Valley.

- c. Determination of future management for "Highline" road along Anderson Lake and upper Cheakamus Valley road after completion of construction.
- d. Further refinement of alignment in Gates and Birkenhead River Valleys and at Pemberton.
- e. Further review of routing at Whistler and the Lower Cheakamus area.
- f. Discussion with Mount Currie Indian Band on present ROW across Lokla Indian Reserve.
- g. Discussion with Squamish Indian Band on present ROW across Cheakamus Indian Reserve.
- h. Further explanation of electric and magnetic field effects to any concerned parties.
- i. Determination of job opportunities and economic benefits that may accrue for local contractors and residents.
- j. Consideration of way of mitigating effects of project in communities.

The environmental issues which have yet to be addressed in planning, construction and operation of a transmission line along the existing corridor are as follows:

- a. Confirmation of final alignment.
- b. Determination of environmental protection plan for construction and operation phases.
- c. Preparation of a site-specific plan for access to ROW to limit potential adverse impacts.
- d. Environmental review of any refinements of alignment.
- e. Preparation of clearing design for project.
- f. Determination of specific situations which may require mitigation, and of appropriate related mitigation measures.

All social and environmental issues will be addressed in the EPC application to the extent possible, and where not possible, the proposed process for addressing them will be identified.

Ancillary Applications

If the project is approved, the following approvals, permits and licenses which may be required under Federal, Provincial and Municipal law will be necessary:

- 1) Those required for construction work and camp operations under the Waste Management Act and the Water Act.
- 2) Special case authorizations under the Agricultural Land Commission Act.
- 3) Authorizations or acquisitions as required by the Land Act.
- 4) Licenses to cut under the Forest Act.
- 5) Permits for crossing pipelines and railroads.
- 6) Permits as required by the Navigable Waters Protection Act.
- 7) Approvals, permits and licenses routinely required from time to time for construction work and camp operation eg. Fisheries Act (Canada).